VALUE ENGINEERING WORKSHOP

WIDENING I-20 TO SIX LANES
Richmond/Columbia County, GA

PREPARED FOR:

Georgia Department of Transportation
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Atlanta, Georgia 30334-1002

PREPARED BY:

U.S. COST

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05 November 2004

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KEY INFORMATION/NOTES

Introduction

U.S. Cost Incorporated conducted the Value Engineering Team Study on Widen I-20 to Six Lanes in Richmond/Columbia County, Georgia. The V.E. study was conducted for three (3) days, 03-05 November 2004, at the Georgia Department of Transportation Conference Room #274 in Atlanta, GA. The study team was furnished with a 35% design package. The following individuals were members of the V.E. team:

Name	Firm	Discipline
Lindsey Gardner, P.E., CVS	U.S. Cost, Inc.	VETL
Ron Osterloh, P.E.	MAAI	Roadway Designer
Sam Deeb, P.E.	MAAI	Bridge Designer
Laland Owens	MAAI	Constructibility
Lisa Myers	GDOT	Value Engineer
George Bradfield	GDOT	Cost Engineer
Tom Hodges	GDOT	Project Liaison

Project Description

The MH-IM-20-2 (145) project is part of the Federal Highway maintenance program. It is also proposed to serve as part of the proposed economic development and relieve congestion on I-20 in Richmond/Columbia Counties near Augusta Georgia. Widening Interstate I-20 to Six Lanes{MH-IM-20-2 (145)} is essential to the effort to reduce the travel demands on the existing corridor through Richmond and Columbia Counties.

The MH-IM-20-2 (145) project connects various major roads throughout Richmond/Columbia County. The project will eliminate congestion on Interstate I-20 coming into Augusta Georgia by constructing two additional traffic lanes, plus upgrade and improvements to the I-529 interchange.

Major structures are proposed as follows:

- One new Washington Street bridge over six lanes of traffic on I-20
- Rehabilitation and widening of Riverwatch Parkway Bridge over six lanes of traffic on I-20
- Potential jacking of Warren Street bridge over six lanes of traffic on I-20

Wetlands identified along the proposed corridor pose no impact on the project.

The Widening of I-20 to Six Lanes project MH-IM-20-2 (145) has an estimated construction cost (ECC) of $ ±39 Million and will be advertised and awarded in 2007.

KEY INFORMATION/NOTES

Concerns and Objectives

These projects are part of an overall scheme to widen I-20 to six lanes, in Richmond/Columbia County, Georgia. Over the past ten years upgrades of have been slowly coming together, spurred by the increased traffic that traverses through Richmond/Columbia Counties. The following are some of the highlighted concerns and objectives noted by the VE team for project:

CONCERNS/OBSERVATIONS	PROBLEMS/OBJECTIVES
Cross Slope Deficiency	Current design of 1% Cross Slope is not in compliance with FHWA criteria of 2%. Drainage and ponding during heavy rains is a serious safety hazard.
Bridge construction	Bridge Construction alternatives and/or suggested changes may require re-submittal to Richmond/Columbia County for approval. Also delays in bid advertisement and award
Choke points at Bridges	Scope Addition: The project should be expanded to insure the chokepoint lanes are eliminated. This will increase the cost of the project by widening Savannah River Bridge and the Augusta Canal Bridge
Material haul distances	Cost and location of borrow material, asphalt plant and concrete plant locations have not been identified. Material delivery may require for temporary road and disposal of excess at end of construction.
Construction sequence/Constructibility	Coordination of this project and traffic management will be difficult but adequate traffic control funds have been identified
Loop Ramps at Washington Road	The merge lane distances are dangerous and the loops should be deleted and Washington Road re-striped for dual lefts, signal lights and etc.
Cost Estimate	Overall cost estimate appears (10-15%) low, especially unit prices on various items.
Speed design of Road – design speed is different for both East & West segments.	Both segments (East and West) of road should be designed for 65 mph
The East side of I-20 will be constructed with concrete pavement and the West side of I-20 will be constructed of asphaltic concrete pavement	The project should use the same pavement materials for both sides of the highway, be it PCC concrete or asphaltic concrete pavement

KEY INFORMATION/NOTES

Project Objectives

- Complete Widening of I-20 to Six Lanes at Interchanges
- Reduce travel time and congestion in Richmond/Columbia Counties
- Benefit the local economy

Information Phase/Function Analysis

The V.E. team was first briefed on the project design by Greenhorne & O'Mara Associates, and GDOT representatives in an orientation meeting the morning of the first day of the V.E. Study. The briefing included a review of the design requirements and rationale for the location and arrangement of the major functional areas. Discussions regarding project funding, required functions, and project criteria followed the design presentation.

As a basic part of the V.E. process, the team conducted a partial function analysis session on the Widen I-20 to Six Lanes project to identify the needs and goals of the project and facilitate the creative idea session, by addressing functions as opposed to the specific design elements.

The Basic Function of the project is to *Enhance Economy***.** A strong secondary function is to *Enhance Travel & Reduce Congestion* by adding one additional lane on each side of I-20 in Richmond/Columbia County, Georgia. A detailed project function analysis of the characteristics of the project and their relationships is presented in Appendix A.

Project Criteria

During the meeting, project goals, criteria and sensitivities were also identified. The following prioritized listing identifies the key items of which the V.E. team should be aware. Criteria with a score of 5 or higher were considered of prime importance, and those criteria therefore must be considered in the review of any design alternative. The ranking below is the V.E. teams' impression of the sensitivity of the criteria from discussions held with GDOT and the A/E representatives.

KEY INFORMATION/NOTES

Project Criteria Analysis

Life Safety	10
Operational Issues	10
Interruptions	10
FHA Criteria Compliance	10
Constructibility	8
GDOT Criteria Compliance	8
Functionality	8
Life Cycle Cost (Analysis)	8
AASHTO 2001 Compliance	7
Local Code Restrictions	7
Maintenance and Operations	6
Cost Savings Impact	2

Risk Analysis

The group identified the following project risk elements, which may impact the construction/widening of existing I-20 through Richmond/Columbia Counties. This exercise served as a catalyst for the Creative Phase of the study, when several ideas were suggested which would mitigate these project construction risks.

Risk Elements

- Maintaining uninterrupted flow of traffic on existing and detour roads during construction
- Current 1% cross slope design that violates FHA criteria
- Delays and impact on the traveling/commuting public/interstate commerce
- Contractor Phasing Coordination and traffic control
- Poor Progress/Quality By A Low Bid Construction Contractor
- Inadequate existing storm drainage pipe sizes
- Inflationary cost of concrete, asphalt and steel
- Failure to meet GDOT advertisement/let date currently scheduled for January 2007
- Accidents and potential lawsuits during construction
- Community demand for more sound transmission walls than currently proposed
- Traffic management and detours during construction
- Community demand (C.O.) for additional sound barrier walls

KEY INFORMATION/NOTES

Creative Phase

The Creative Phase of the V.E. study was initiated the morning of the second day of the study. A total of seventeen (17) creative ideas were generated for further investigation by the team. Many of the creative ideas focused on enhancements to the roadway safety, line of site, excavation techniques, ramp storage, utility locations, and drainage impact, plus various other design elements of the Project. Additional ideas were generated reflecting alternative materials based on an understanding of local construction products and materials and the relative costs of installing them.

A listing of all creative ideas on Widening I-20 to Six Lanes is included in Appendix A.

Evaluation Phase

The ideas generated during the Creative Phase were reviewed and evaluated by the VE team during a meeting held on the morning of the second study day. The intent of the meeting was to allow the V.E. team an opportunity to discuss and evaluate the ideas. A few of the V.E. ideas were dropped at that time as being conceptually unacceptable or in conflict with established Criteria, Right of Way (ROW) conflicts, previous agreements, or local construction methods. The ranking system consisted of VE team representatives assigning a designation to each idea. Those ideas, which the V.E. Team felt had the most promise, were given a designation of 1-5 on acceptability and 1-5 on cost impact, for a maximum rating of 10 points. This is a time management tool to identify those proposals that have the greatest potential. Approximately fifteen (15) out of the original seventeen (17) creative ideas were deemed promising for further investigation and analysis by the V.E. team.

The time management ranking system used by the VE team is as follows:

FEASIBILITY OF IDEA

5 points - Excellent Idea
4 points - Good Idea
3 points - Fair Idea
2 points – Marginal Idea
1 point - Poor Idea –do not develop

COST IMPACT

5 points - > $ 500,000
4 points - $400,000 to 499,999
3 points - $300,000 to 399,999
2 points - $200,000 t0 299,999
1 point – zero to $199,999
DS – Design Suggestion – sometimes reflects an increase in cost

KEY INFORMATION/NOTES

Development Phase

The specific proposals found in the body of this report represent the positive results of Investigations by the V.E. team on Widening I-20 to Six Lanes Interchange Project MH-IM-20-2 (145). Each proposal represents a quality enhancing or cost saving alternative, which is documented by words, drawings and numbers. The proposal format presents the idea, describes the original design element proposed for change and the proposed change, lists the perceived advantages and disadvantages of the proposed change and supports the idea with a detailed cost estimate for the original and proposed design. Where necessary for clarity, the proposal also includes thumbnail design drawings and supporting engineering calculations.

Many of the V.E. proposals may require some level of redesign on specific portions of the project to implement the modification. Further, several of the V.E. ideas may involve modifications to the Criteria, or current goals, to Widen I-20 to Six Lanes project. These ideas are presented to initiate additional discussion and investigation during the next phase of design.

Presentation Phase

A final presentation was not scheduled for the last day of the study.

Resolution Phase

Upon receipt of the Final Value Engineering Report, Widen I-20 to Six Lanes, Greenhorne & O'Mara and GDOT design representatives are requested to prepare written comments on the acceptability of each of the V.E. proposals. Responses should include the rationale for accepting, rejecting, or modifying the V.E. proposal.

KEY INFORMATION/NOTES

Basis of V.E. Cost Savings

The cost information for proposals in this report are based on the cost data prepared by the design A/E /Georgia Department of Transportation designers and bid tabs. Therefore, the savings presented in the proposals is a general order of magnitude (estimate of the potential savings) if the idea were to be accepted. These figures are solely intended to identify the most attractive design solution, and are not prepared to represent a net deduction to the overall project budget. The costs are in 2004 dollars. All life cycle cost analyses are prepared utilizing Present Worth methodology, a 25-year economic period, a 4.0% net discount factor (inclusive of inflation), and 3% escalation in the cost of utilities. With a bid opening of February 2007 it appears the estimate is 10% -15% inadequate and needs to be re-evaluated. All cost proposals have been marked up 30% for E & C (10%) & five years of inflation.

Sustainable/Green Design Proposals

Sustainable design incorporates energy conservation, increased use of renewable energy sources, the reduction or elimination of toxic and harmful substances in facilities, efficiency in resource and material utilization, recycling of building materials, the use of recycled material, the reduction of waste products during both the construction and operation of the facility, and facility maintenance practices that reduce or eliminate harmful effects on people and the natural environment. In keeping with the National Policy objective of building all new facilities with sustainable design features, the VE team proposed sustainable design elements and/or practices. There are no developed sustainable proposals in this report; however, the construction contactor should have the option to employ construction techniques and materials and use re-cycled asphalt and crushed concrete as appropriate.

SUMMARY OF RECOMMENDATIONS

NUMBER	PROPOSAL DESCRIPTION	CAPITAL SAVINGS	OP. & MAINT. (PW)	TOTAL SAVINGS (LCC)	GDOT PM	A/E G&M	LOCAL RECOM	FINAL
	ROADWAY/PROFILE (RW)							
1.0	Scope Reduction: Minimize proposed pavement widening to provide minimum shoulders and eliminate pavement for future lanes and median barriers	4,234,000		**4,234,000**				
2.0	Allow the contractor the bid option for both asphaltic concrete pavement or PC concrete pavement	Design suggestion		**DS**				
4.0	Combine I-520 Interchange improvement project with Widening I-20 to Six Lanes project	Design Suggestion		**DS**				
5.0	Cost Impact to project if 2% cross slope is mandated by FHWA	(3,793,000)		**(3,793,000)**				
6.0	Demolish all existing pavement on eastern side and reconstruct with all asphaltic concrete pavement	(417,000)		**(417,000)**				
7.0	Modify drainage layout to provide additional cross drains or resize existing cross drains	62,000		**62,000**				
8.0	Investigate termini and lane drops	Design Suggestion		**DS**				
9.0	Provide additional auxiliary facilities as part of the project, including ATMS/ITS and interstate and interchange lighting	Design Suggestion		**DS**				

SUMMARY OF RECOMMENDATIONS

NUMBER	PROPOSAL DESCRIPTION	CAPITAL SAVINGS	OP. & MAINT. (PW)	TOTAL SAVINGS (LCC)	GDOT PM	A/E G&M	LOCAL RECOM	FINAL
	ROADWAY/PROFILE (RW)							
10.0	Design proposed interstate improvement and correct any existing deficiencies to meet a minimum of a 65 mph design speed	Design Suggestion		**DS**				
11.0	Eliminate loop roads at Washington Road and re-configure Washington Road with signal lights	Design Suggestion		**DS**				
12.0	Install a subsurface drainage system under the proposed I-20 pavements at appropriate locations	Design Suggestion		**DS**				
	STRUCTURAL/BRIDGES (SB)							
1.0	Shorten @ Washington Road Bridge to a single span with MSE walls to accommodate ADA sidewalks	801,000		**801,000**				
4.0	Use HPC concrete for the Washington Road Bridge and reduce the number of beams	128,044		**128,044**				
5.0	Replace Riverwatch Parkway Bridge with Pre-stressed Concrete (PSC) beams & MSE end bents	191,134		**191,134**				
6.0	Expanded scope Widen Savannah River Bridge and Augusta Canal Bridge in congruence with this contract to avoid bottle neck	Design Suggestion		**DS**				

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-1.0
PAGE NUMBER:	1 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: MINIMIZE PROPOSED PAVEMENT WIDENING TO PROVIDE MINIMUM SHOULDERS AND ELIMINATE PAVEMENT FOR FUTURE LANES AND MEDIAN BARRIERS.

ORIGINAL DESIGN: The original design consists of paving the entire existing 64' median and providing a concrete median barrier. With a six foot shift in the travel lane towards the median the proposed section would include a 14' paved inside shoulder and a 16' paved outside shoulder.

PROPOSED CHANGE: The proposed change recommendation would eliminate additional paving that is not required for the minimum interstate laneage and shoulders. This change would require a grassed median with double faced guardrail along the entire length of the improvements.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 5,782,295		$ 5,782,295
PROPOSED CHANGE:	$ 1,548,769		$ 1,548,769
		SAVINGS:	$ 4,233,526

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-1.0
PAGE NUMBER:	2 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Total life cycle cost savings of $4,233,526.

Minimize the increase in runoff to the existing cross drain pipes.

Eliminate/reduce construction and future maintenance of median barrier inlets and longitudinal pipe network.

DISADVANTAGES:

Future widening would become much more complicated.

Maintenance of grassed medians will be difficult in the congested urban areas.

JUSTIFICATION:

The proposed traffic volumes do not currently justify the future construction of the fourth through lane. Upon widening to four through lanes the outside shoulders will then become inadequate and will require reconstruction.

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	RW-1.0
PAGE NUMBER:	3 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Shoulder Pvmnt (Partial Depth)	GDOT	SY	21,026	29.74	625,313
Median Barrier	GDOT	LF	23,654	58	1,371,932
Drainage	1	LS	1	700,000	700,000
Asphalt Pavement	GDOT	SY	12,179	42.45	516,999
Concrete Pavement	GDOT	SY	19,360	93.69	1,813,838
				SUBTOTAL:	5,028,082
				15 % MARK UP:	754,213
				TOTAL:	5,782,295

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Shoulder Pvmnt (Full Dept)	GDOT	SY	21,026	39.41	828,635
Dbl. Face Guardrail	GDOT	LF	23,654	15.52	367,110
Drainage	1	LS	20%	140,000	140,000
Grassing	GDOT	AC	13	847	11,011
				SUBTOTAL:	1,346,756
				15 % MARK UP:	202,013
				TOTAL:	1,548,769

SOURCES

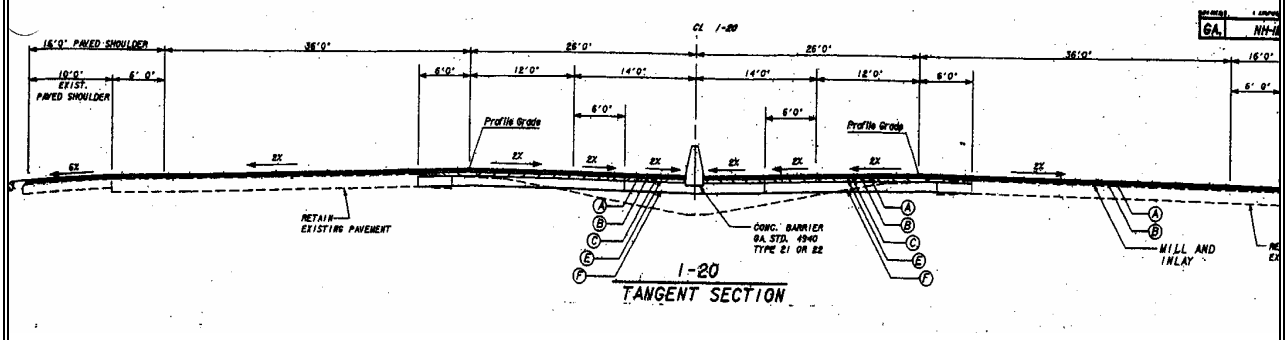
1. Project Cost Estimate
2. CES Data Base
3. CACES Data Base
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER:	RW-1.0
PAGE NUMBER:	4 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

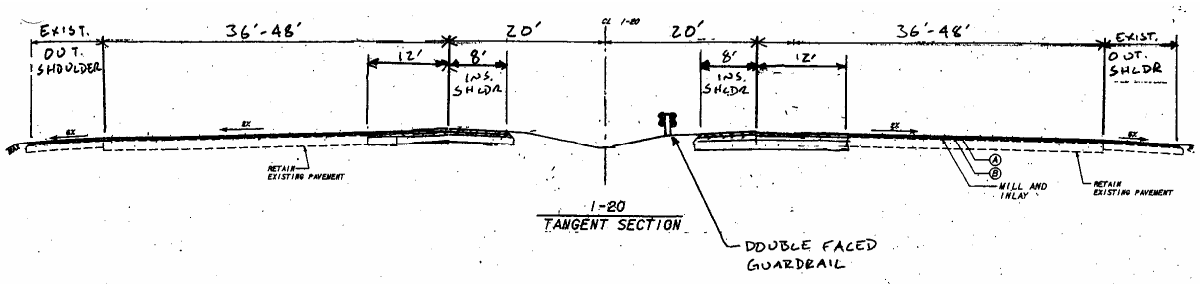


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	RW-1.0
PAGE NUMBER:	5 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA



PROPOSED CHANGE CALCULATIONS

PROPOSAL NUMBER:	RW-1.0
PAGE NUMBER:	6 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Cost Reduction:

12’ Asphalt Mainline Pavement (1.73 miles)
12’ Concrete Mainline Pavement (2.75 miles)
Concrete Median Barrier
8’ Asphalt Shoulder Pavement (4.48 miles)

Cost Additions

Grassing, 24’ of depressed grassed median (4.48 miles)
Double Faced Guardrail (4.48 miles)
8’ Full Depth Pavement, reqd. for M.O.T. (4.48 miles)

Mainline Pavement Costs:

PEM $68.94/ton @ 90 lbs/SY – $3.10/SY
Surface $39.06/ton @ 165 lbs/SY - $3.22/SY
Binder $46.30/ton @ 220 lbs/SY – $5.09/SY
Asp. Base $43.67/ton @ 440 lbs/SY – $9.67/SY
Base $21.43/SY
Total = $42.45/SY

12” Concrete Pavement - $60.25/SY
Asp Base $43.67/ton @ 550 lbs/SY – $12.01/SY
Base $21.43/SY
Total = $93.69/SY

Shoulder Pavement Costs:

Surface $39.06/ton @ 165 lbs/SY - $3.22/SY
Binder $46.30/ton @ 220 lbs/SY – $5.09/SY
Asp. Base $43.67/ton @ 440 lbs/SY – $9.67/SY
Base $21.43/SY
Total = $29.74/SY (partial depth)
Total = $39.41/SY (full depth for M.O.T)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-2.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: ALLOW CONTRACTOR BID OPTION FOR BOTH ASPHALTIC CONCRETE PAVEMENT OR PC CONCRETE PAVEMENT.

ORIGINAL DESIGN: The current design for Westside lanes proposes asphaltic concrete pavement for widening with an asphaltic concrete leveling course and asphalt overlay of existing lanes. The current design for the Eastside specifies plain PC concrete pavement for all work.

PROPOSED CHANGE: The proposed change recommendation is to allow the construction contractor an option to use either asphaltic concrete for widening on the Eastern portion also and overlay retained existing pavement.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-2.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Setup of two different paving methods will not be necessary.

Could easily correct substandard (1%) cross slope with asphalt option.

Final pavement markings could be achieved without eradication.

Future maintenance methods would be uniform over a longer roadway segment.

Bidding market will produce the lowest cost per SY.

The ability to use competing pavement materials could attract a broader group of bidders.

DISADVANTAGES:

Long term behavior of asphalt overlayed concrete could result in rutting.

Would require overlay of outside shoulders with rumble strips.

Would require minor outside shoulder building (re-building).

Suppliers of concrete and their professional association would not want to be excluded.

JUSTIFICATION:

The proposal would provide for a uniform typical section throughout the project limits, reduce initial cost and provide the ability to make necessary cross slope corrections.

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-4.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: COMBINE THE DESIGN DOCUMENTS TO PROVIDE ONE CONSTRUCTION CONTRACT FOR BOTH THE I-20 WIDENING AND THE I-520 INTERCHANGE IMPROVEMENTS.

ORIGINAL DESIGN: The current design provides separate construction contract documents for both the I-20 widening project from Bel Air Road to the Augusta Canal and for the I-520 Interchange Improvements project. The I-20 widening project includes a project exception of approximately 2.24 miles for the I-520 project.

PROPOSED CHANGE: The proposed changes would consist of combining the separate projects into one construction package that would be let as one contract.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-4.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Reduce construction administrative expenses associated with two construction contracts.

Ensures the harmonious staging requirements between the two projects.

Eliminates logical termini issues that are present if the projects are let separately.

DISADVANTAGES:

The increased size of the contract may limit the competitiveness of the construction bids.

Increase in the difficulty of preparing and reviewing the larger design package.

JUSTIFICATION:

The combination of both projects would ensure that the two projects are constructed concurrently. Since the same design firm is providing the designs, there would be minimal changes associated with the plan combination.

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-5.0
PAGE NUMBER:	1 of 4

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: COST IMPACT TO PROJECT IF 2% CROSS SLOPE IS MANDATED BY FHWA.

ORIGINAL DESIGN: The current design assumes a design exception will be granted from FHWA for a 1% sub-standard cross slope.

PROPOSED CHANGE: The cost impact for not granting a 1% cross slope design exception will increase the project cost $±4,000,000. This assumes replacing the outside lane with plain PC pavement 12 inches thick at design cross slope with inherent upgrade. It should be noted that if asphaltic pavement is acceptable the additional costs for this change is reduced to $±500,000.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 0		$ 0
PROPOSED CHANGE:	$ (3,793,000)		$ (3,793,000)
		SAVINGS:	$ (3,793,000)

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-5.0
PAGE NUMBER:	2 of 4

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Total life cycle cost savings of $(3,793,000).

Cross slope correction to standard lessens liability.

Reduction in wet weather accidents.

Concrete industry would like increased volume of sales.

DISADVANTAGES:

Loss of value or rehabilitation project NHS-M002-00(212).

Requires shoulder reconstruction.

Requires reworking ramp tie-ins.

Extensive pavement marking eradication on concrete.

JUSTIFICATION:

The outside lane is structurally and functionally sound as a result of recent rehabilitation.

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	RW-5.0
PAGE NUMBER:	3 of 4

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Leave lane 3 in place					0
				SUBTOTAL:	0
				_____% MARK UP:	
				TOTAL:	0

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
R/R lane 3 conc. Pave	7	SY	30,334	88.89	2,696,389
Shoulder pave & reconstruct	7	SY	20,222	29.74	601,605
				SUBTOTAL:	3,297,994
				15% MARK UP:	494,699
				TOTAL:	3,792,693

SOURCES

1. Project Cost Estimate
2. CES Data Base
3. CACES Data Base
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

PROPOSED CHANGE CALCULATIONS

PROPOSAL NUMBER:	RW-5.0
PAGE NUMBER:	4 of 4

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Remove and Replace 22,750 L.F. of outside lane.

Sta 188+45 to Sta 229+00 = 4,055 ft
Sta 243+00 to Sta 280+00 = 3,700
Sta 303+00 to Sta 323+00 = 2,000
Sta 328+00 to Sta 344+20 = 1,620

11,375 L.F x 2 sides = 22,750 L

$\frac{22,750 \text{ ft} \times 12 \text{ ft}}{9 \text{ ft}^2/\text{yd}^2} = 30,334 \text{ sy}$ (Lane 3)

$\frac{22,750 \text{ ft} \times 8 \text{ ft}}{9 \text{ ft}^2/\text{yd}^2} = 20,222 \text{ sy}$ (outside shoulder)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-6.0
PAGE NUMBER:	1 of 5

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: REMOVE ENTIRE EXISTING ROAD EASTERN PORTION OF THE PROJECT AND REPAVE TO TYPICAL DESIGN SECTION WITH FULL DEPTH ASPHALTIC CONCRETE PAVEMENT.

ORIGINAL DESIGN: The original design stipulates leaving the outside PCC pavement lane in place and widening 36 feet inside with 12 inches of PCC pavement.

PROPOSED CHANGE: The proposed recommendation is to delete/demolish the PCC pavement and provide the same asphaltic concrete pavement structure (section) as proposed for the Western portion utilizing the same typical dimensions as shown. The recommendation also calls for the removal of the outside PCC pavement lanes and replacing with full depth asphaltic concrete paving.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 13,767,310		$ 13,767,310
PROPOSED CHANGE:	$ 14,184,128		$ 14,164,128
		SAVINGS:	$ (416,818)

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-6.0
PAGE NUMBER:	2 of 5

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Total life cycle cost increase of $(417,000).

Corrects cross slope to meet design standards.

Smoother ride characteristics.

Will not require pavement markings eradication.

Routine maintenance of pavement is less disruptive to traffic.

Aesthetically matches Western portion of project.

Eliminates one of the required paving operations.

Pavement would age uniformly.

Allows for installation of addition cross drain without open cuts.

DISADVANTAGES:

Milling and overlay required approximately every 10 years.

Portland Cement Association (PCA) and concrete vendors would not be pleased.

JUSTIFICATION:

A major problem with the current design is that a substandard cross slope (1%) on the outside lanes controls the design template. The substandard cross slope is extended with the current design with an anticipation of increased wet weather accidents. For about 1% increase in project reconstruction cost the substandard cross slope can be corrected to current FHWA design standards; thereby greatly reducing GDOT owner liability

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	RW-6.0
PAGE NUMBER:	3 of 5

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Concrete pavement	7	SY	132,845	59.48	7,901,621
Remove PCC pavement	7	SY	86,872	46.85	4,069,953
				SUBTOTAL:	11,971,574
				15% MARK UP:	1,795,736
				TOTAL:	13,767,310

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Full depth Asph. Conc. (48ft)	7	SY	172,940	42.05	7,270,398
Remove PCC pavement	7	SY	86,872	46.85	4,069,953
R&R outside shoulder	7	SY	33,412	29.74	993,673
				SUBTOTAL:	12,334,024
				15% MARK UP:	1,850,104
				TOTAL:	14,184,128

SOURCES

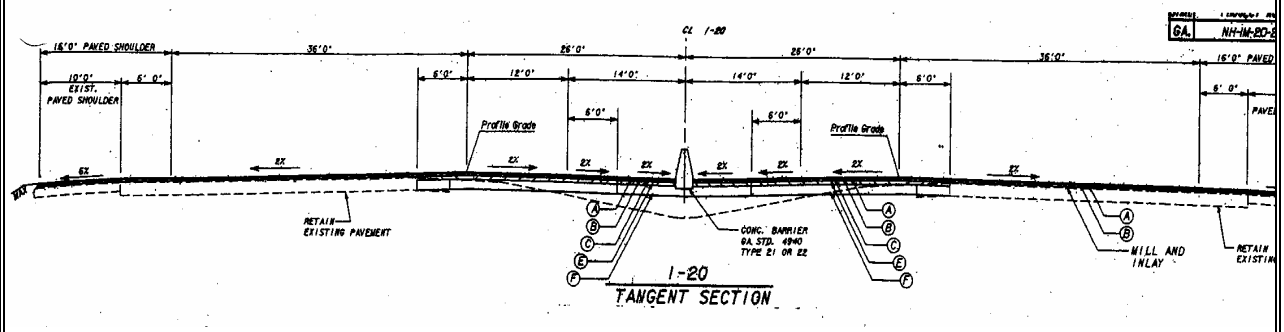
1. Project Cost Estimate
2. CES Data Base
3. CACES Data Base
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER:	RW-6.0
PAGE NUMBER:	4 of 5

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

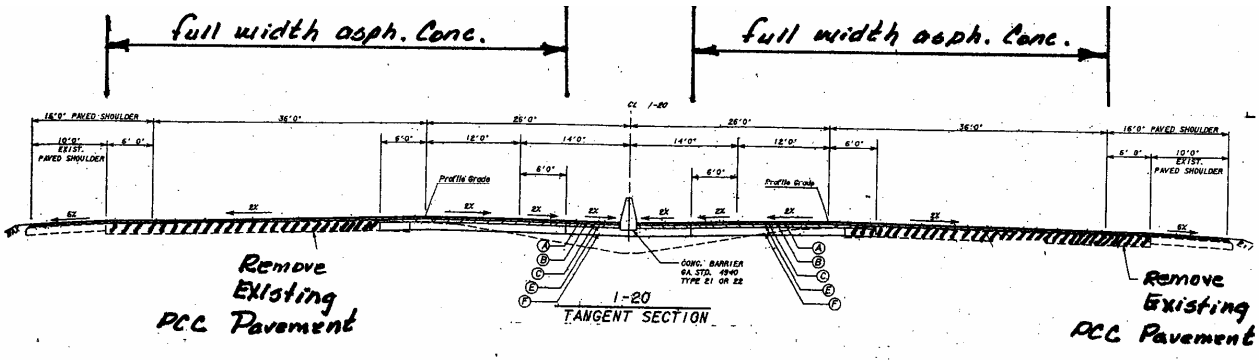


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	RW-6.0
PAGE NUMBER:	5 of 5

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA



VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-7.0
PAGE NUMBER:	1 of 6

PROJECT TITLE: WIDEN I-20 SIX LANES

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: MODIFY DRAINAGE LAYOUT TO PROVIDE ADDITIONAL CROSS DRAINS OR RESIZE EXISTING CROSS DRAINS.

ORIGINAL DESIGN: The original design does not include any reconstruction or new construction of cross drain pipes across the I-20 travel lanes. The proposed median drains to a longitudinal network of median barrier drop inlets which flow to existing cross drain pipes. The majority of the cross drains are 15" pipes and may be inadequately sized to accommodate the increase in runoff as a result of the shortage in time of concentration and increase in the runoff coefficient.

PROPOSED CHANGE: The proposed changes recommendation would include the construction of additional median cross drain pipes to accommodate the increased runoff within the median. These changes would allow for a decrease in the current design longitudinal pipes.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 154,848		$ 154,848
PROPOSED CHANGE:	$ 92,689		$ 92,689
		SAVINGS:	$ 62,159

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-7.0
PAGE NUMBER:	2 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Total life cycle cost savings of $92,689.

Safer design by reducing potential for stormwater backup on shoulders and travel lanes.

The majority of the existing cross drains are sized to accommodate the runoff from a grassed median.

The existing cross drains conditions are unknown. Due to the age/conditions of the pipes it would be a benefit to replace the pipes during this project construction.

DISADVANTAGES:

Additional Staging requirements for construction of the cross drain pipes.

Future maintenance of proposed cross drain pipes is more difficult.

JUSTIFICATION:

The construction of the additional cross drains would reduce the total length of storm drain pipe as well as provide a safer design.

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	RW-7.0
PAGE NUMBER:	3 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
15" Storm Drain Pipe	1	LF	2,370	43.48	103,047
18" Storm Drain Pipe	1	LF	970	32.58	31,603
				SUBTOTAL:	134,650
				15% MARK UP:	20,198
				TOTAL:	154,848

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
18" Storm Drain Pipe	1	LF	1,340	32.58	43,657
24" Storm Drain Pipe	1	LF	170	47.74	8,116
Pavement at Trenching	1	SY	500	42.45	21,225
SES	1	EA	11	691	7,601
				SUBTOTAL:	80,599
				15 % MARK UP:	12,090
				TOTAL:	92,689

SOURCES

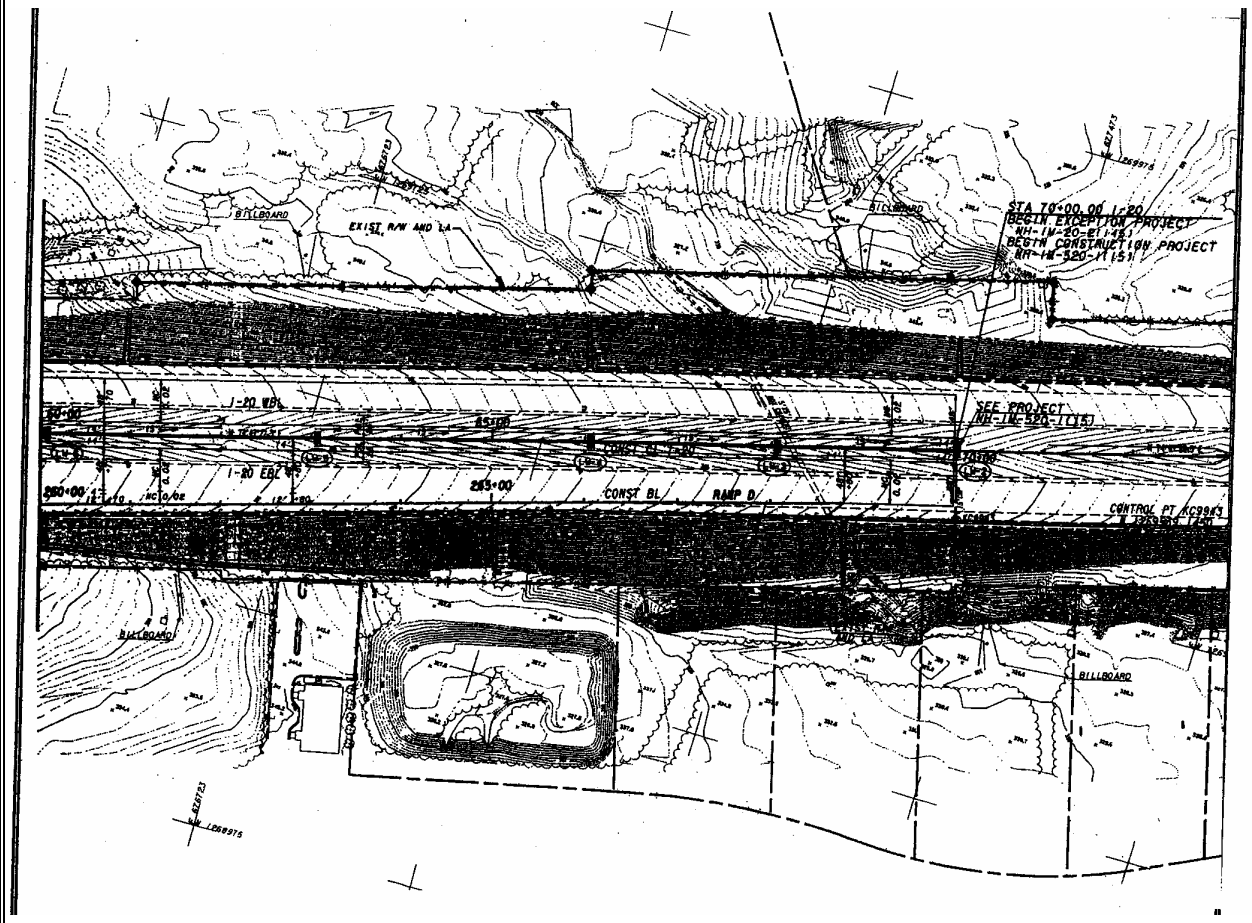
1. Project Cost Estimate
2. CES Data Base
3. CACES Data Base
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER:	RW-7.0
PAGE NUMBER:	4 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

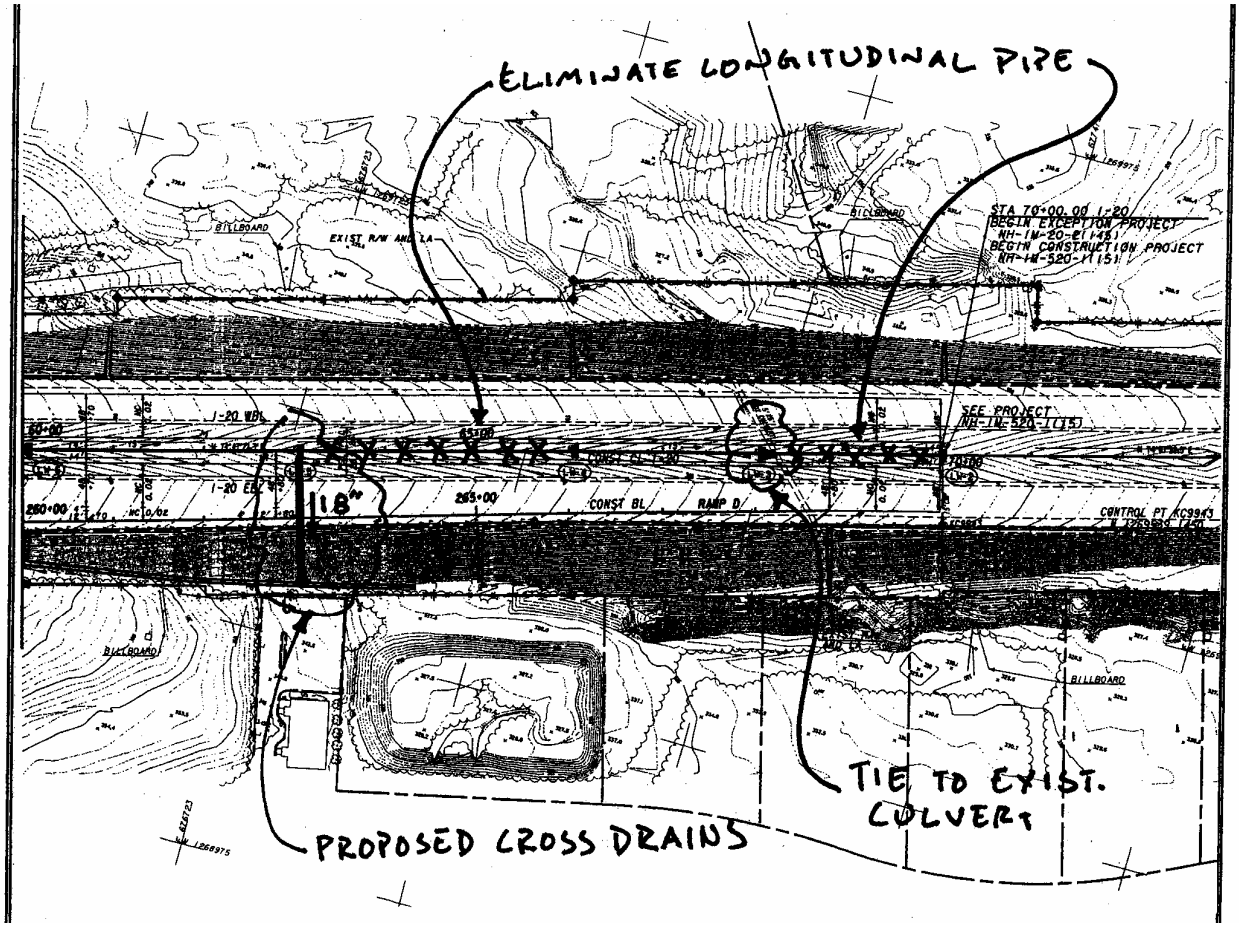


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	RW-7.0
PAGE NUMBER:	5 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA



PROPOSED CHANGE CALCULATIONS

PROPOSAL NUMBER:	RW-7.0
PAGE NUMBER:	6 of 6

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Modify the following Longitudinal Systems:

Drainage System	Pipe to Exclude (LF)	Size (In)	Proposed Pipe (LF)	Size (In)
BW	300	18	110	18
DW	260	18	110	18
EW	110	18	Tie to Ex. Cross Drain	18
GW	300	15	100	18
IW	260	15	150	18
KW	170	15	170	18
LW	300	15	150	18
OE	230	15	Tie to Ex. Cross Drain	18
RE	270	15	100	18
SE	100	15	100	18
XE	300	18	170	24
YE	500	15	250	18
FE	240	15	100	18
Total	3,340		1,510	

Additional Pavement Trenching:

11 crossings at 10’ wide by 40’ long = 500 SY

Additional Safety End Section required = 11

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-8.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: FURTHER INVESTIGATE PROJECT TERMINI TO REDUCE OR ELIMINATE CONGESTION AT LANE DROPS.

ORIGINAL DESIGN: The original design widens I-20 from 2 lanes to 3 lanes in each direction. At both the beginning and end of the project the third lane will need to be dropped with a left lane taper. At the project beginning the design also includes the drop of an auxiliary lane to the Bel Air interchange exit ramp; therefore, the westbound traffic will narrow from four to two lanes within close proximity. The project end consists of tapering the left lane of the I-20 eastbound traffic just prior to the bridge over the Augusta Canal.

PROPOSED CHANGE: The proposed change would consist of modifying the project termini to reduce the congestion associated with tapering the left travel lane. This change would require extending the westerly project limits and extending or modifying the eastern project terminus. The proposed options at the western terminus include extending the third lane approximately 4 miles and drop the lane at the next exit, extend the third lane an additional distance to provide a greater separation from the lane drops, or do not include the fourth auxiliary lane as part of this project and drop the third lane at the Bel Air Road Exit. This last option would require traffic from the I-20/Wheeler Road westbound on ramp to merge with I-20 traffic. The proposed options at the project end would include extending the project across the Augusta Canal and the Savannah River to the first exit in South Carolina, or to drop the third lane at the River Watch Parkway exit. As part of the Value Engineering study, the required time and resources are not available to select the most beneficial option.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-8.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Reduce or eliminate congestion at bottlenecks.

If the option to extend the project limits is selected it would provide additional capacity along I-20 for a greater distance.

Eliminate need for future widening along the I-20 corridor for the additional project length.

Simplify Maintenance of Construction.

DISADVANTAGES:

Additional design delays and costs would be incurred as part of the project design development.

Additional construction costs if the project limits are extended.

JUSTIFICATION:

As currently designed the tapers would present a situation similar to the taper at GA 400 NB and Haynes Bridge Road. The selection of the preferred options would depend on current and projected traffic volumes in the project vicinity. The project as currently designed has the potential of creating serious traffic delays as well as an unsafe merging condition.

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-9.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: PROVIDE ADDITIONAL AUXILIARY FACILITIES AS PART OF THE PROJECT, INCLUDING ATMS/ITS AND INTERSTATE AND INTERCHANGE LIGHTING.

ORIGINAL DESIGN: The current design does not include Automated Traffic Management Systems (ATMS) or Intelligent Transportation Systems (ITS) facilities as part of the construction documents. Also the current design does not show proposed lighting along the interstate or at the interchanges.

PROPOSED CHANGE: The proposed change recommendations would include, at a minimum, installing the infrastructure for future ATMS/ITS systems including message boards, traffic monitoring cameras, speed detection cameras as well as other facilities currently utilized by the Office of Traffic and Safety. The change would also include installing lighting standards along the median barrier as well as high mast lighting at the existing interchanges within the project corridor.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-9.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Increase in safety and driver awareness.

Reduce congestion.

Would meet current GDOT and FHWA interstate improvement standards.

DISADVANTAGES:

Additional design and construction costs.

JUSTIFICATION:

There is currently a Traffic Management Center in Augusta that could manage and accommodate the proposed ATMS system. Since there are currently some cameras located along the I-20 corridor it would be beneficial to the Department of Transportation and the FHWA to install the entire network as part of this project and the concurrent I-520 project. Due to the heavy volumes and merging/weaving requirements within the project limits, the interstate corridor should be provided with lighting facilities. Also, it appears that there are some existing lighting standards at some of the interchanges. Due to the tight turning radii and congested conditions of the interchanges, high mast lighting would be very beneficial to the traffic conditions.

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-10.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: DESIGN PROPOSED INTERSTATE IMPROVEMENTS AND CORRECT ANY EXISTING DEFICIENCIES TO MEET A MINIMUM 65 MPH DESIGN SPEED.

ORIGINAL DESIGN: The current design states that the proposed improvements will be designed to accommodate a 65 mile per hour speed design within Richmond County and 55 mile per hour speed design in Columbia County.

PROPOSED CHANGE: The proposed changes would include updating the construction documents to provide a design that will accommodate a 65 mph speed design for both proposed and existing design features, including horizontal and vertical curvature, super elevations and merging tapers.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-10.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Provide safer driving conditions.

Meets driver expectancy.

DISADVANTAGES:

Increased construction and design cost.

Additional Redesign time requirements.

Will require additional Maintenance of Traffic requirements.

JUSTIFICATION:

As informed during the Value Engineering study, the design speed used by Greenhorne and O'Mara is still in question. FHWA and GDOT standard design practices utilize a minimum of a 70 mile per hour speed design for interstate corridors. Due to driver expectancy and current interstate vehicle speeds within the state of Georgia, the 70 mph design standard is justified. This project should provide a minimum of a 65 mile per hour speed design.

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-11.0
PAGE NUMBER:	1 of 3

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: REMOVE LOOP RAMPS AT THE WASHINGTON ROAD INTERCHANGE.

ORIGINAL DESIGN: The original design leaves the two loop ramps at Washington road in place without upgrades.

PROPOSED CHANGE: The proposed change recommendation is to eliminate both loop ramps and upgrade diamond ramps as necessary to restore the operating characteristics of a conventional diamond interchange.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-11.0
PAGE NUMBER:	2 of 3

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Mainline bridge over Washington Road would not have to be widened as much (one lane less).

The substandard merge from ramp G would no longer exist.

Solves the pedestrian problem associated with their crossing the loop ramps.

Eliminates need for one single lane ramp bridge.

DISADVANTAGES:

Existing diamond entry ramps would need to be upgraded.

Signal cycle time would have to include a portion of time for left turners.

Washington Road would require overlay, restriping & signing.

Might not be politically popular.

Converts free flowing right turns into signizalized left turns possibly increasing travel time along Washington Road corridor.

Cost of removal, disposal and restoration of areas.

May cost an additional ±$1,000,000.

JUSTIFICATION:

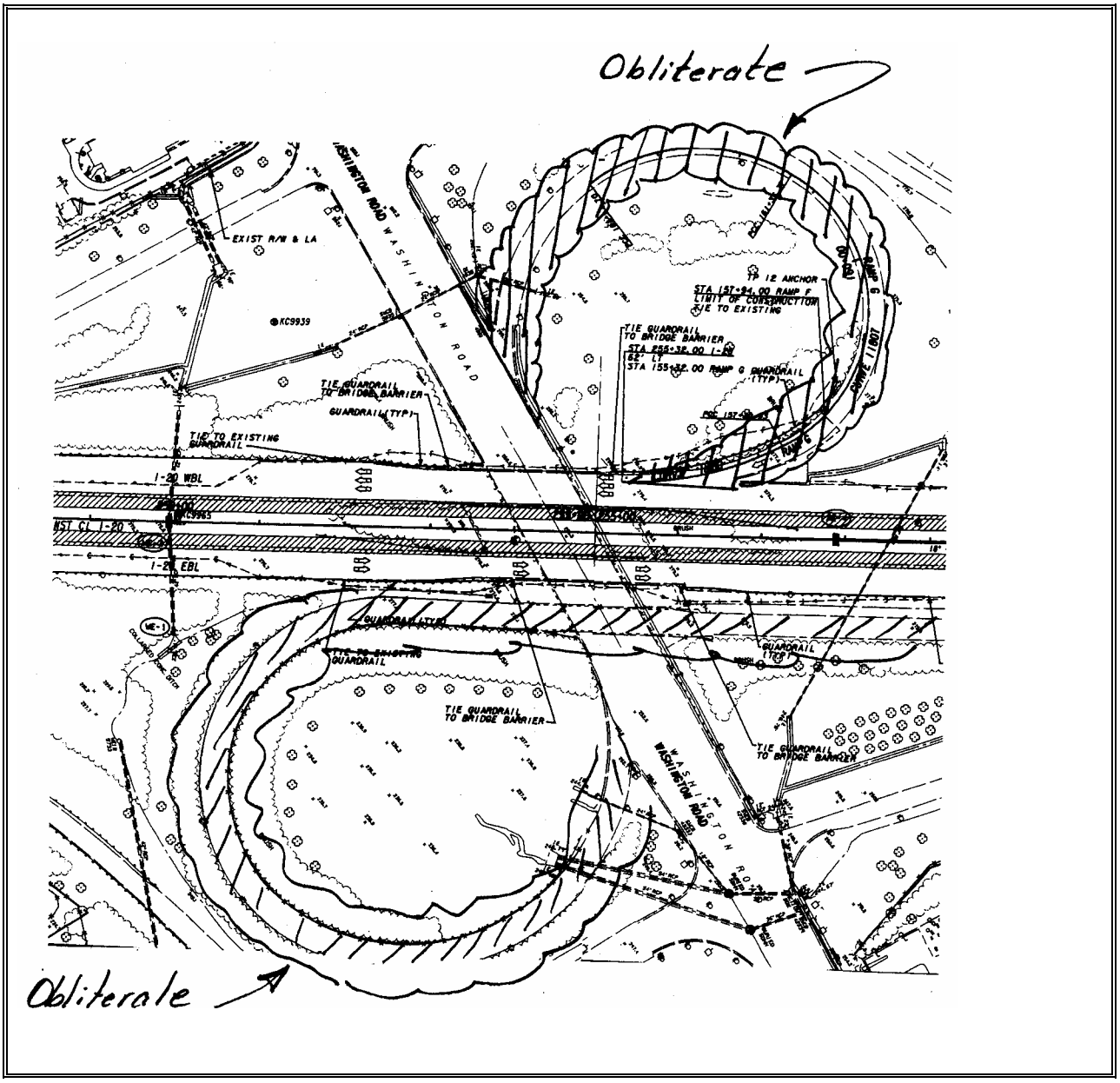
The addition of the I-20/River Watch Parkway Interchange has diverted substantial central business district traffic to the new interchange reducing the required capacity at the Washington Road/I-20 interchange. Pedestrian volumes continue to increase along Washington road and their movement cannot be safely addressed with the loop ramps in place.

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	RW-11.0
PAGE NUMBER:	3 of 3

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA



VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	RW-12.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: INSTALL A SUBSURFACE DRAINAGE SYSTEM UNDER THE PROPOSED I-20 PAVEMENT AT APPROPRIATE LOCATIONS.

ORIGINAL DESIGN: The current design does not include a drainage layer under the proposed mainline pavements. The existing travel lanes that are to remain do not have any existing subsurface drainage system.

PROPOSED CHANGE: The proposed changes would include a subsurface drainage system to be installed as part of this project. The system should include a drainage layer and adequately sized underdrain pipes under the pavements at appropriate locations including sag vertical curves, uphill side of bridge ends, or other locations that may designated by the soil survey or upon field inspection.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	RW-12.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: WIDEN I-20 TO SIX LANES

PROJECT LOCATION: GDOT – RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Reduce future maintenance requirements of Interstate pavements.

Reduce risk of subgrade pavement failures.

DISADVANTAGES:

Increase of construction cost ± ($500,000).

Possible future maintenance of underdrain system.

JUSTIFICATION:

Due to the sensitivity of the both the surface and sub surface drainage of this area, inclusion of the drainage system at appropriate locations could greatly benefit the life span of the proposed pavements. Also, current design and construction practices have been leaning toward the inclusion of underdrain systems in appropriate areas.

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	SB-1.0
PAGE NUMBER:	1 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: SHORTEN BRIDGE AT WASHINGTON ROAD TO SINGLE SPAN WITH MSE WALLS TO ACCOMMODATE SIDEWALKS.

ORIGINAL DESIGN: The proposed design incorporates the replacement of the bridge at Washington Road with proposed piers aligned with the existing ones.

PROPOSED CHANGE: The proposed change recommended design suggests the use of a single span bridge with MSE walls to accommodate a straight alignment of sidewalks behind the pier of the existing piers.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 2,669,069		$ 2,669,069
PROPOSED CHANGE:	$ 1,867,639		$ 1,867,639
		SAVINGS:	$ 801,430

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	SB-1.0
PAGE NUMBER:	2 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Total life cycle cost savings of $801,430.

Straight alignment of sidewalks.

Less costly.

Faster Construction.

Less materials.

Improves sight distance for pedestrians from access ramp to end of bridge.

DISADVANTAGES:

Does not allow for expansion of Washington Road.

Drainage requirements may need to be addressed.

JUSTIFICATION:

Aligning the sidewalks from the existing ramp piers to the new bridge underneath compels the design to be changed whereby functional requirements are met.

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	SB-1.0
PAGE NUMBER:	3 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Washington Bridge	4	SF	31,586	65	2,053,130
				SUBTOTAL:	2,053,130
				% MARK UP:	615,939
				TOTAL:	2,669,069

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Washington Bridge	4	SF	17,190	65	1,117,350
2-MSE Walls	4	SF	6,652	48	319,296
				SUBTOTAL:	1,436,646
				30% MARK UP:	430,993
				TOTAL:	1,867,639

SOURCES

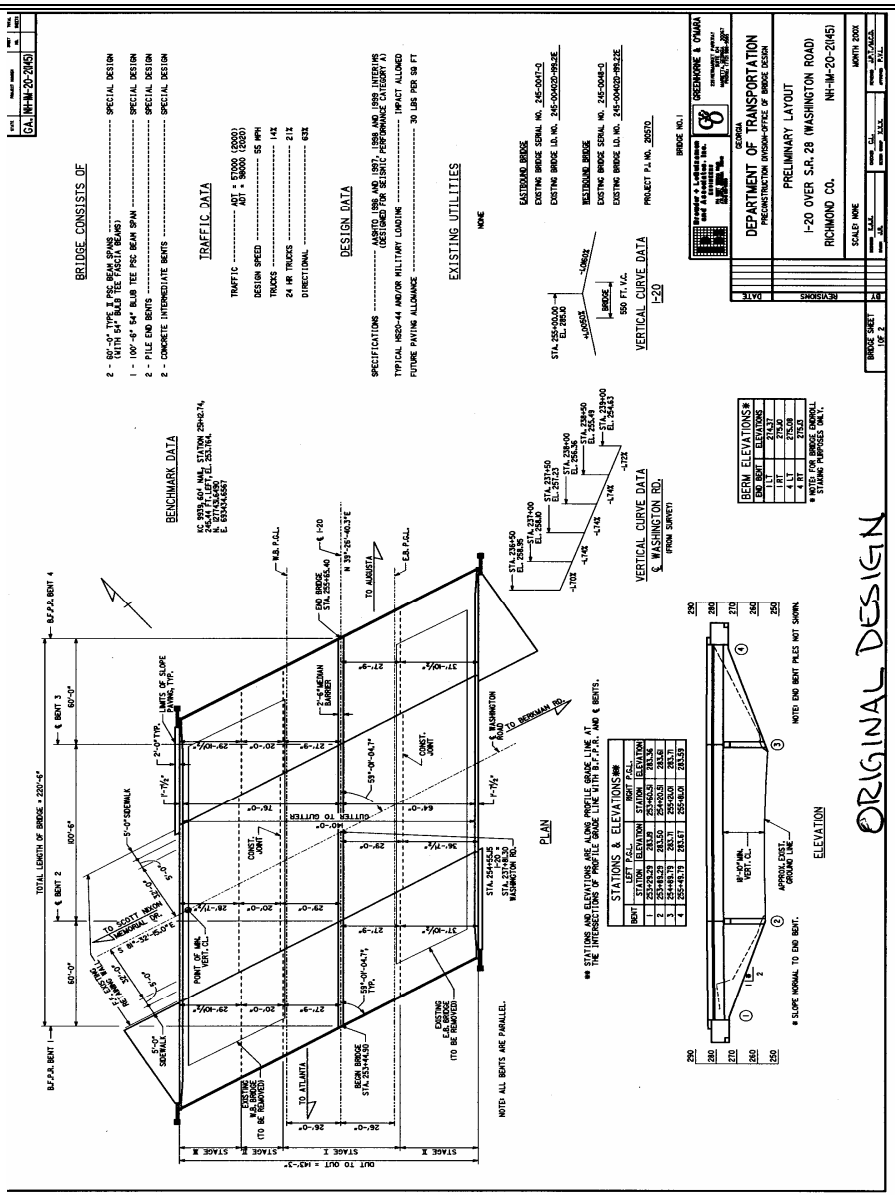
1. Project Cost Estimate
2. CES Data Base
3. CACES Data Base
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER:	SB-1.0
PAGE NUMBER:	4 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

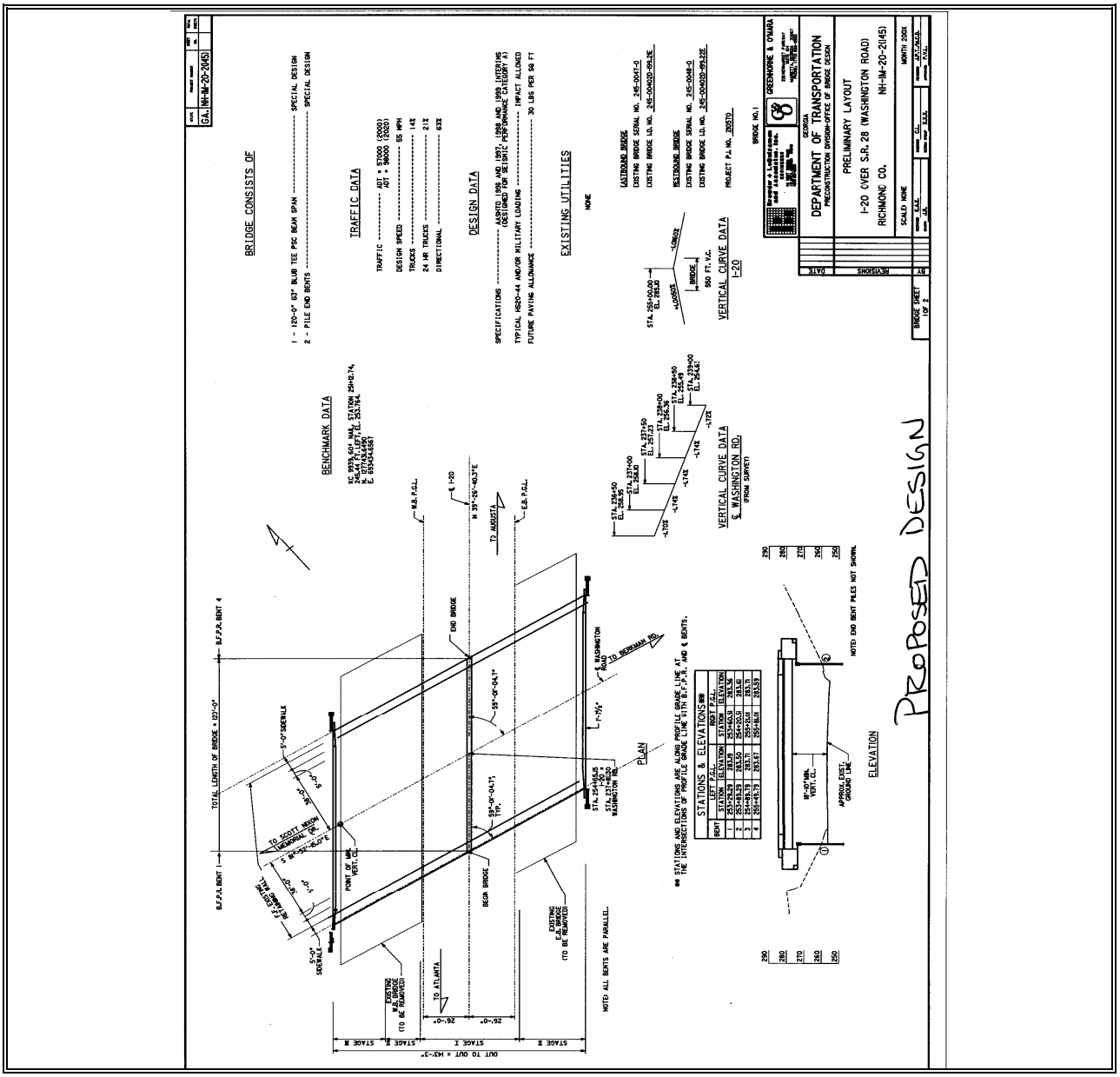


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	SB-1.0
PAGE NUMBER:	5 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA



ORIGINAL DESIGN CALCULATIONS

PROPOSAL NUMBER:	SB-1.0
PAGE NUMBER:	6 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Bridge Length= 220.5’
Bridge Width= 143.25’
Total Footage=31,586 SF
Unit Price based on Past GDOT bridge construction for similar projects= 65 SF
Total Cost= $2,053,090

PROPOSED CHANGE CALCULATIONS

PROPOSAL NUMBER:	SB-1.0
PAGE NUMBER:	7 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Bridge Length= 120’
Bridge Width= 143.25’
Total Footage=17, 190 SF
Unit Price based on Past GDOT bridge construction for similar projects= 65 SF
Total Cost= $1,117,350

Walls length = 143.25’ + 2 (18’ Clearance) = 179.25’
Wall Height=18’
Total Wall Footage=3226*2walls=6652 SF
Unit Price of walls= 48 $/SF
Total Price= 319,296

Total Price of Proposed Bridge= $1,436,646

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	SB-4.0
PAGE NUMBER:	1 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: USE HPC CONCRETE FOR THE WASHINGTON BRIDGE AND REDUCE NUMBER OF BEAMS.

ORIGINAL DESIGN: The proposed design utilizes 54" BT and Type II PSC beams with a total number of beams per span equaling 21.

PROPOSED CHANGE: The proposed recommendation suggests the use of HPC beams, which reduces the number of beams from 21 to 17 per span drastically reducing the costs and construction time.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 672,235		$ 672,235
PROPOSED CHANGE:	$ 544,190		$ 544,190
		SAVINGS:	$ 128,044

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	SB-4.0
PAGE NUMBER:	2 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Total life cycle cost savings of $128,044.

Less costly.

Faster Construction.

Less materials.

Utilize FHWA preferences.

Functional construction and use of materials.

DISADVANTAGES:

Pre-caster's setup for HPC.

Staged and non-uniform spacing of beams.

JUSTIFICATION:

The functionality of HPC and its favorable reduction of beams expedite both precasting and construction time as well as reduce costs and material usage.

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	SB-4.0
PAGE NUMBER:	3 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
42 Type II PSC Beams	4	LF	2,520	98	246,960
21 BT 54 Beams	4	LF	2,110.5	128	270,144
				SUBTOTAL:	517,104
				% MARK UP:	155,131
				TOTAL:	672,235

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
34 Type II PSC Beams HPC	4	LF	2,040	98	199,920
17 BT 54" HPC Beams	4	LF	1,708.5	128	218,688
				SUBTOTAL:	418,608
				30% MARK UP:	125,582
				TOTAL:	544,190

SOURCES

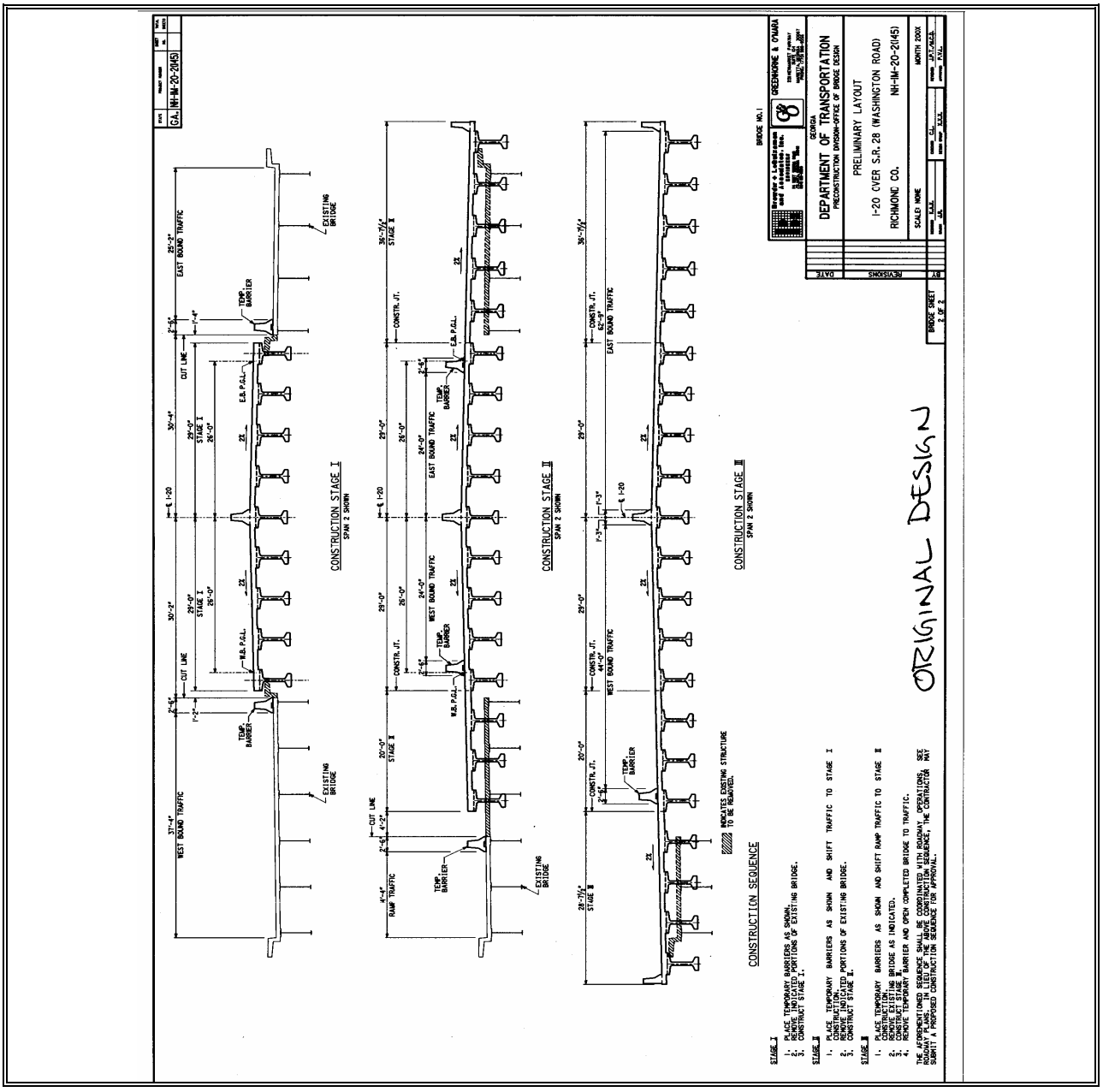
1. Project Cost Estimate
2. CES Data Base
3. CACES Data Base
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER:	SB-4.0
PAGE NUMBER:	4 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

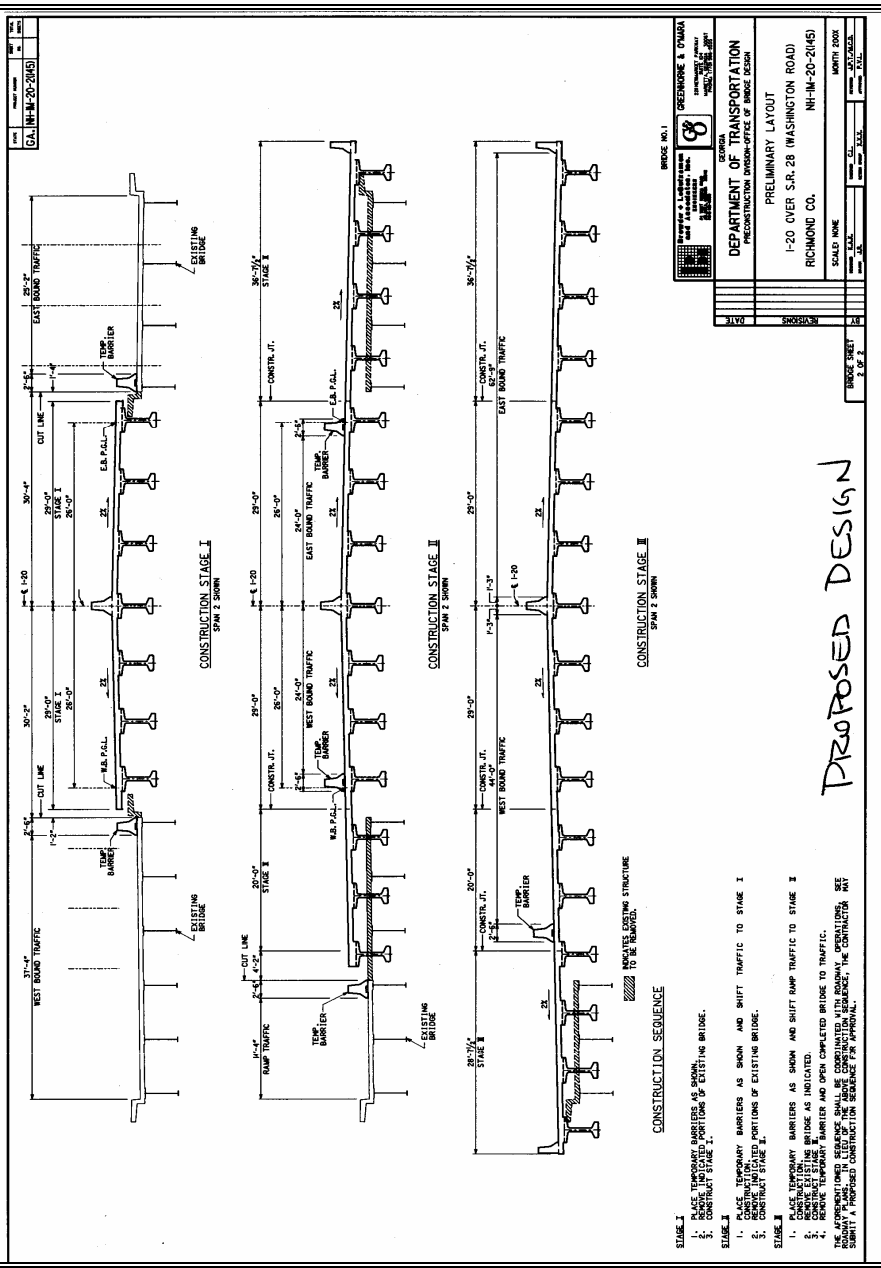


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	SB-4.0
PAGE NUMBER:	5 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA



ORIGINAL DESIGN CALCULATIONS

PROPOSAL NUMBER:	SB-4.0
PAGE NUMBER:	6 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Bridge Length= 220.5’
Bridge Width= 143.25’
Type II No. Beams=21
54 BT No. Beams= 21
Unit price of Type II beams= $98
Unit Price of 54 BT=$128
Type II spans= 2*60’=120’
54BT span=100.5’
Total Cost=[(2*60*98)+100.5*128]*21
Total Cost= $517,104

PROPOSED CHANGE CALCULATIONS

PROPOSAL NUMBER:	SB-4.0
PAGE NUMBER:	7 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Bridge Length= 220.5’
Bridge Width= 143.25’
Type II No. Beams=17
54 BT No. Beams= 17
Unit price of Type II beams= $98
Unit Price of 54 BT=$128
Type II spans= 2*60’=120’
54BT span=100.5’
Total Cost=[(2*60*98)+100.5*128]*17
Total Cost= $418,608

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	SB-5.0
PAGE NUMBER:	1 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: REPLACE RIVER WATCH BRIDGE WITH PSC BEAMS MSE END BENTS.

ORIGINAL DESIGN: The proposed design incorporates the use of the existing bridges and widens to the inside by constructing the additional bridge in the area between them.

PROPOSED CHANGE: The recommended design suggests the complete replacement of the existing bridges by constructing a completely new 143-3" wide by 259' long bridge.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 3,359,070		$ 3,359,070
PROPOSED CHANGE:	$ 3,550,204		$ 3,550,204
		SAVINGS:	$ 191,134

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	SB-5.0
PAGE NUMBER:	2 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Meets FHWA Expectation.

Less costly if Present Value analysis is conducted.

State of the Art technology & material use versus old W36 Fy 36ksi.

Reduce Maintenance by eliminating steel painting.

Eliminate additional future construction 5-10 years when existing bridges deteriorates.

DISADVANTAGES:

Total life cycle cost Increase of $191,134.

Increase face value construction costs.

Diminish the life span of the existing structures.

Increase construction time.

Increase materials.

JUSTIFICATION:

To meet the new functionality of PSC concrete technology, eliminate maintenance, and short-term future need for complete replacement

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	SB-5.0
PAGE NUMBER:	3 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Widening	4	LF	17,226SF	150	2,583,900
				SUBTOTAL:	2,583,900
				30 % MARK UP:	775,170
				TOTAL:	3,359,070

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Bridge	4	SF	37,102	65	2,411,630
Walls	4	SF	6,652	48	319,296
				SUBTOTAL:	2,730,926
				30 % MARK UP:	819,278
				TOTAL:	3,550,204

SOURCES

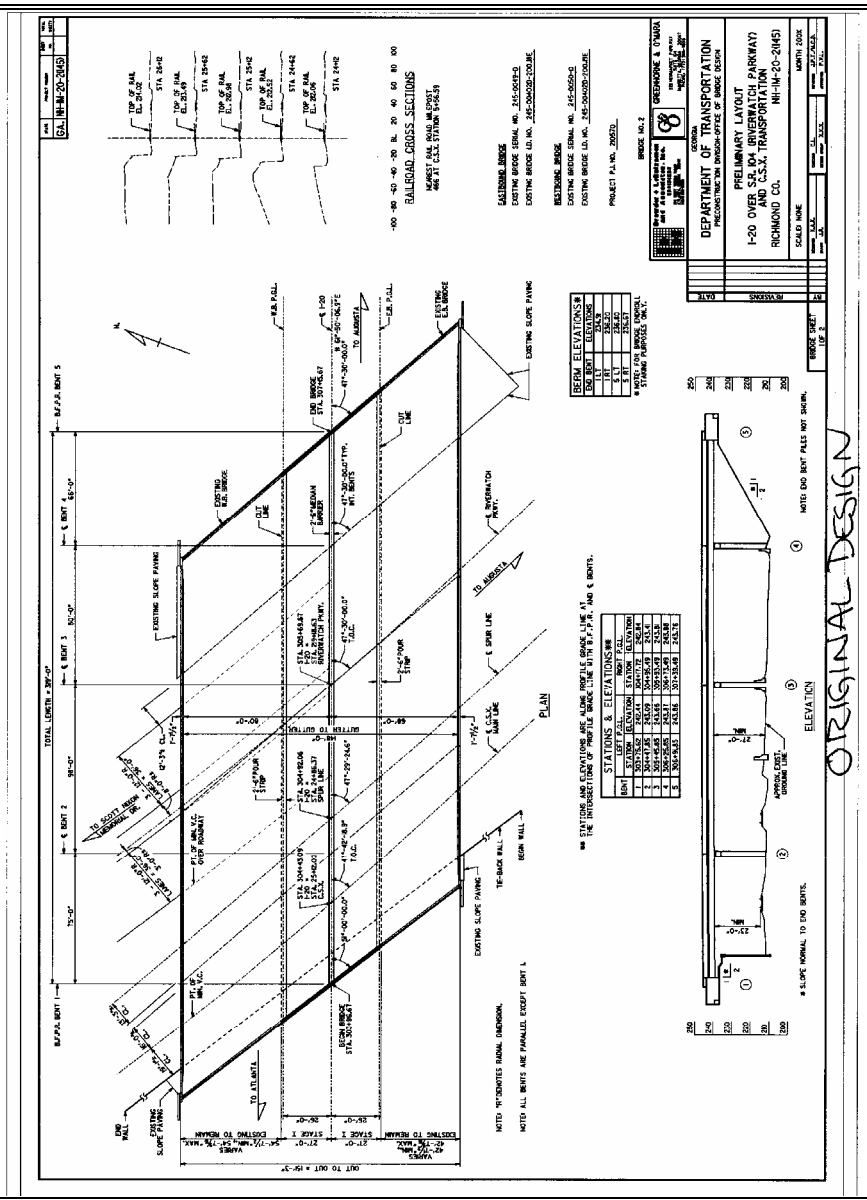
1. Project Cost Estimate
2. CES Data Base
3. CACES Data Base
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER:	SB-5.0
PAGE NUMBER:	4 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

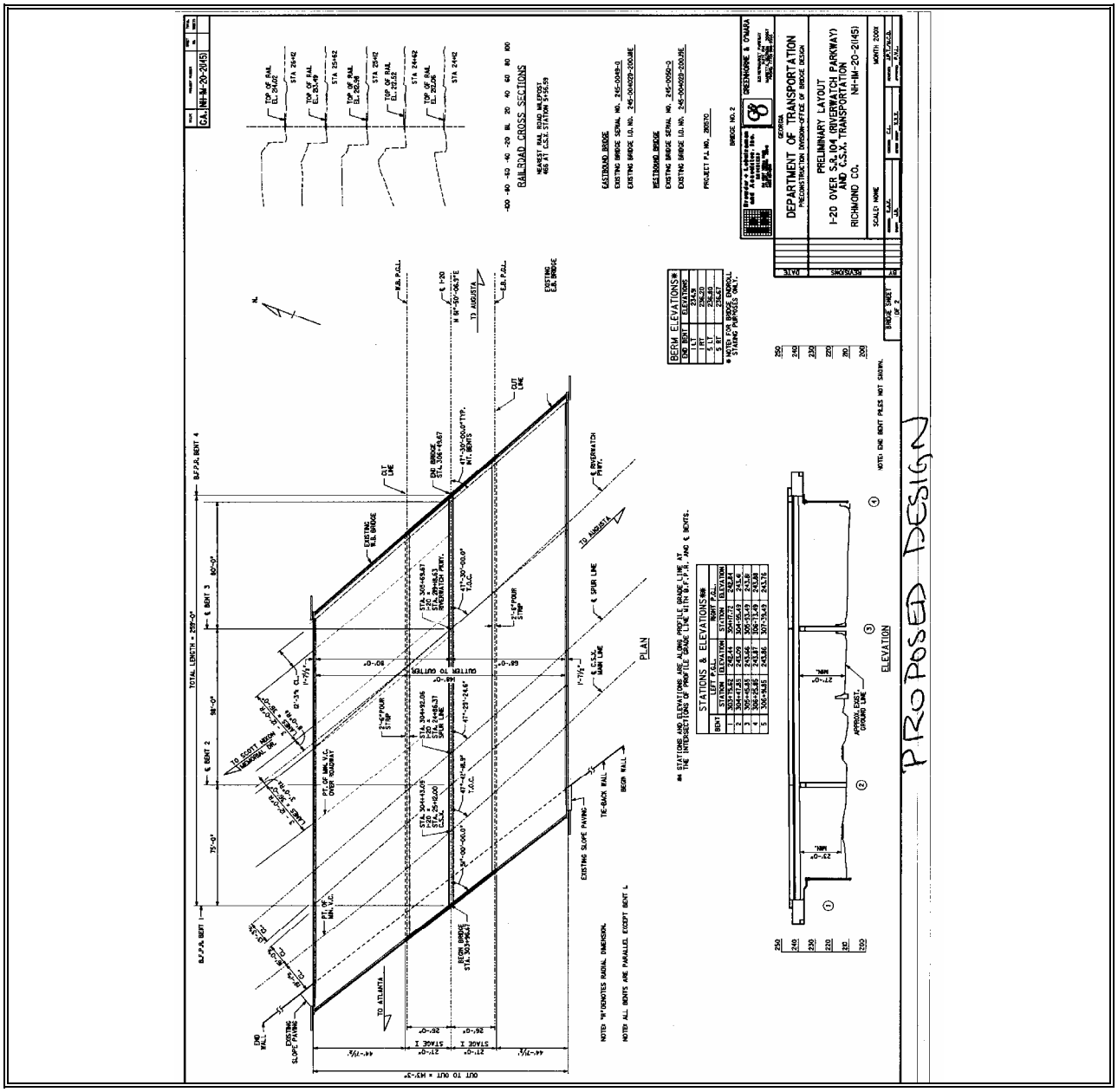


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	SB-5.0
PAGE NUMBER:	5 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA



ORIGINAL DESIGN CALCULATIONS

PROPOSAL NUMBER:	SB-5.0
PAGE NUMBER:	6 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Bridge Length= 319’
Bridge Width= 54’

Total Footage= 17,226SF
Unit price= $150/SF
Total Cost= $2,583,900

PROPOSED CHANGE CALCULATIONS

PROPOSAL NUMBER:	SB-5.0
PAGE NUMBER:	7 of 7

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

Bridge Length= 259’
Bridge Width= 143.25’

Total Footage= 37102 SF
Unit price= $65/SF
Total Cost= $2,411,630

Walls length = 143.25’ + 2 (18’ Clearance) = 179.25’
Wall Height=18’
Total Wall Footage=3226*2walls=6652 SF
Unit Price of walls= 48 $/SF
Total Price= 319,296

Total Price of Proposed Bridge= $2,675,042

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	SB-6.0
PAGE NUMBER:	1 of 4

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

PROPOSAL DESCRIPTION: WIDEN SAVANNAH RIVER & AUGUSTA CANAL BRIDGES IN CONGRUENCE WITH THIS CONTRACT.

ORIGINAL DESIGN: The proposed design Does not incorporate the need for the Augusta Canal and Savannah River Widening of the existing bridges thereby allowing for a bottleneck situation

PROPOSED CHANGE: The proposed change recommended design suggests the widening of the existing bridges at Augusta and Savannah crossings including the approaches that tie in to this project.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:			
PROPOSED CHANGE:			
		SAVINGS:	Design Suggestion

ADVANTAGES/DISADVANTAGES/JUSTIFICATION

PROPOSAL NUMBER:	SB-6.0
PAGE NUMBER:	2 of 4

PROJECT TITLE: WIDEN I-20 TO SIX LANES.

PROJECT LOCATION: GDOT - RICHMOND/COLUMBIA COUNTY, GA

ADVANTAGES:

Meets FHWA Expectation.

Less costly if Present Value analysis is conducted.

Eliminates the bottleneck effect.

Reduce possible congestion and accidents occurrences.

DISADVANTAGES:

Total life cycle cost Increase of $24,537,428.

Increase face value construction costs.

Increase construction time.

Increase materials.

JUSTIFICATION:

To meet the new widened section criteria and bottleneck effect.

IM-20-2(117) Richmond
P.I. No. 210327

Preliminary Cost Estimate for Safety Improvements to I-20 Bridges over the Savannah River and the Augusta Canal 3/31/04

I-20 Bridge over the Savannah River:

Widening 6' outside LT. & Rt. and 60' between the existing structures	
(1008' length of PSC spans)(72' widening)($60/ft^2) =	$4,354,560
(208' length of continuous unit spans)(72' widening)($150/ft^2) =	$2,246,400
Subtotal =	$6,600,960

I-20 Bridge over the Augusta Canal:

Widening 6' outside LT. & Rt. and 60' between the existing structures
(410' length of W beam continuous unit spans)(72' widening)($150/ft^2) = $4,428,000

Subtotal Bridge Widening Cost: **$11,028,960**

I-20 Roadway Widening:

Reconstruction of the inside travel lanes, widening 18' to the median eastbound and westbound with paved inside shoulders and concrete median barrier
(Compared to NH-IM-20-2(145) Richmond/Columbia County P.I. No.210570)

Length in Georgia (Riverwatch Parkway to the Savannah River):	
(1.1 mi.)($4,200,000/mi.) =	$4,620,000
Length in South Carolina (Savannah River to 1st exit in S.C.):	
(0.7 mi.)($4,200,000/mi.) =	$2,940,000

Subtotal Roadway Widening Cost: **$7,560,000**

Subtotal Cost - Roadway and Bridges:	**$18,588,960**
5 years inflation at 4%	$3,717,792
10% E & C	$2,230,676
Total Estimated Cost – Roadway and Bridges:	**$24,537,428**

Georgia's Share of Cost

I-20 Bridge over the Savannah River:	
Georgia pays for half the cost for improvements	$3,300,480
I-20 Bridge over the Augusta Canal:	
Georgia pays for all of the cost for improvements	$4,428,000
I-20 Roadway Widening in Georgia:	$4,620,000
Subtotal – Georgia's Share of Cost:	**$12,348,480**
5 years inflation at 4%	$2,469,696
E&C – Georgia pays for all E&C	$2,230,676
Total – Georgia's Share of Cost:	**$17,048,852**

South Carolina's Share of Cost

I-20 Bridge over the Savannah River:	
South Carolina pays for half the cost for improvements	$3,300,480
I-20 Roadway Widening in South Carolina:	$2,940,000
Subtotal – South Carolina's Share of Cost:	**$6,240,480**
5 years inflation at 4%	$1,248,096
Total – South Carolina's Share of Cost:	**$7,488,576**

CONTACT DIRECTORY

NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
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Courtney Johnson	00741049	GDOT/Traffic Safety & Design	4) 635-8128	courtney.johnson@dot.state.ga.us

COST MODEL

	COST $	% OF TOTAL
INFLATION FOR 5 YEARS (4% PER YEAR)	$6,277,035	16.18%
CONCRETE PAVEMENT	$5,180,970	13.35%
BRIDGE OVER RIVERWATCH PARKWAY	$4,215,000	10.86%
10% E & C	$3,525,000	9.09%
25.0MM SUPERPAVE	$2,838,600	7.32%
CLASS B CONC. BASE OF PAVEMENT WIDENING	$2,412,690	6.22%
TRAFFIC CONTROL (CONTRACTOR)	$2,300,000	5.93%
CONCRETE MEDIAN BARRIER 25000LF	$2,108,000	5.43%
CLEARING AND GRUBBING	$1,858,500	4.79%
BRIDGE OVER WASHINGTON ROAD	$1,688,400	4.35%
LEVELING AND TACK COAT	$1,219,000	3.14%
12.5MM SUPERPAVE	$769,253	1.98%
EROSION CONTROL TEMPORARY	$750,000	1.93%
STORM DRAINAGE - LUMP SUM	$700,000	1.80%
SIGNS, STRIPING, SIGNALS, AND LIGHTING	$230,000	0.59%
FENCING 7400 LF	$138,400	0.36%
GRASSING & LANDSCAPE	$130,000	0.34%
FIELD ENGINEER	$40,000	0.10%
UNCLASSIFIED EXCAVATION	$38,400	0.10%
GUARDRAIL	$36,000	0.09%
RIGHT OF WAY	$0	0.00%
TOTALS ($)	$36,455,248	100.00%

FUNCTION ANALYSIS

The following functions for Widening I-20 to Six Lanes project were identified during discussions with the GDOT design representatives (design team consultants) on the first day of the study. These two word functions consist of an active verb, and a quantifiable (measurable) noun. The functions represent the proposed capital improvement expenditures of Widening I-20 to Six Lanes project, and assist the V.E. team in becoming familiar with the needs of the project and the long-term goals for these improvements of Widen I-20 to Six Lanes Interchange. The Basic Function of the project is to "Enhance Economy". The following are considered by the V.E. team to be Secondary and Supporting Functions.

Verb	Noun		Verb	Noun
Construct	Bridge		Reduce	Congestion
Reduce	Cost		Bridge	Interstate
Add	Lanes		Construct	Bridges
Construct	Intersections		Identify	Centerline
Adjust	Grades		Identify	Edge
Serve	Communities		Reuse	Materials
Serve	Public		Package	Contracts
Protect	Commuters		Develop	Options
Satisfy	Users		Develop	Alternatives
Support	Councils		Define	Performance
Minimize	Lawsuits		Develop	Specification
Improve	Access		Reduce	Liability
Enhance	Image		Re-cycle	Materials
Enhance	Signage		Drain	Median
Reduce	Risk		Enhance	Maintainability
Relieve	Traffic		Minimize	Relocations
Enhance	Economy		Expedite	Travel
Reduce	Delays		Improve	Functions
Maintain	Passage		Improve	Drainage
Improve	Constructibility		Correct	Drainage
Benefit	Community		Protect	Environment

FUNCTION ANALYSIS

Verb	Noun		Verb	Noun
Improve	Flow		Accommodate	
Increase	Capacity		Reduce	Risks
Add	Lanes		Accommodate	Breakdowns
Increase	Speeds		Protect	Species
Reduce	Delays			
Straighten	Alignment		Segregate	Materials
Improve	Line-of-Sight		Store	Materials
Improve	Visibility		Access	Materials
Enhance	Visibility		Access	Storage
Straighten	Road		Remove	Soils
Reduce	Interruptions		Communicate	Changes
Reduce	Delays		Relocate	Soils
Identify	Passing			
Accommodate	Passing			
Minimize	Intersections		Contain	Flow
Improve	Intersections		Control	Flow
Reduce	Accidents		Stage	Materials
Improve	Safety		Complete	Corridor
Separate	Lanes		Reduce	Congestion
Provide	Detours		Satisfy	Codes
Install	Medians		Meet	Schedules
Enhance	Definition		Improve	
Assure	Safety		Improve	Functions
Accommodate	Hauling		Satisfy	Agencies
Expedite	Hauling		Utilize	Guidelines
Minimize	Hauling		Construct	Bridge
Control	Traffic		Support	County
Maintain	Passage		Support	Tourism
Phase	Construction		Access	Fair
Utilize	Resources		Protect	Species
Maximize	Utilization		Improve	Weaving
Protect	Landmarks		Help	Commuters
Guide	Traffic		Satisfy	Public
Transmit	Information		Satisfy	Commuters
Manage	Traffic		Support	Weight

COST DRIVER ANALYSIS

The V.E. team reviewed the project cost elements and identified the controlling element or cost driver for Widen I-20 to Six Lanes Interchange, Project MH-IM-20-2 (145). The cost drivers are used in the brainstorming process as a focal point of discussion and for idea generation.

Element	Function	Cost Driver
Excavation	Improve Interchange Relieve Congestion Adjust Grade Improve Alignment Improve Drainage	Disposal Sites Demolition/Removal Shoulder Width Road Length & Width
Road Section	Support Weight Maintain Surface Support Vehicles Distribute Load Overlay Road Lengthen Ramps Detour Traffic	Base Course Materials Source of Materials Wearing Surface Drainage System Road Length & Width Median Width Shoulder Width
Bridges	Bridge Roads Improve Safety Support Weight Support Vehicles Connect Communities	Bridge Heights Foundation Protection Materials Used Structural Design Length of Beams Lengths of Bridge Wall Construction Number of Spans
Earth Stabilization	Insure Safety Reduce Risk Minimize Lawsuits	Require Methods Material Types Material Quantities Areas of Application Frequency of Use
Traffic Management	Insure Safety Maintain Passage Avoid Delays Assist Commuters Assist Tourist	Methods of Control Frequency of Control Duration of Control

BRAINSTORMING OR SPECULATION

PROJECT TITLE:	WIDEN I-20 TO SIX LANES
PROJECT LOCATION:	RICHMOND/COLUMBIA COUNTY, GEORGIA

NUMBER	IDEA	RANK
	ROADWAY (RW)	
1.0	Reduce scope by paving a minimum for six lanes with grass median	5/3
2.0	Allow contractor bidding option to bid concrete pavement of asphalt pavement	DS
3.0	Move sound wall closer to travel lanes to reduce clearing and grubbing	DS
4.0	Combine as one bid package I-520 Interchange Improvements project with the Widening of I-20 to Six Lanes project	DS
5.0	Cost Impact if FHA does not grant wavier of 1% cross slope	DS
6.0	Do not use concrete as an option – eliminate the newly constructed concrete 12'wide lane 3 and reconstruct with asphalt	DS
7.0	Modify drainage by adding more cross slope and larger pipes	2/3
8.0	Correct/eliminate bottle necking at beginning and at end of project	DS
9.0	Provide additional ATMS facilities: cameras, message boards & etc.	DS
10.0	Design road for 65 mph ilo current 55 mph design speed	DS
11.0	Eliminate loop roads @ Washington Street	DS
12.0	Include drainage component adjacent to road	DS
	BRIDGES (SB)	
1.0	Shorten bridge/enrolls @ Washington Street bridge to accommodate ADA sidewalk	5/5
2.0	Retain & widen Washington Street bridge	Drop
3.0	Allow HPC concrete for Washington Street bridge & reduce the number of beams/spacing	4/2
4.0	Replace the entire Riverwatch Parkway Bridge with a shorter bridge	4/0
5.0	Expand scope: Widen Savannah River Bridge and Augusta Canal Bridge	DS

VALUE ENGINEERING WORKSHOP AGENDA

WIDENING I-20 TO SIX LANES
RICHMOND/COLUMBIA
PROJECT NO. NH-IM-20-2(145)

GEORGIA DOT

24 HOUR - V.E. STUDY
03-05 November 2004

The value engineering workshop for the subject project will be conducted for three (3) days from 03-05 November 2004, **at the Georgia Department of Transportation General Office, Planning Conference Room #274 (Planning Conference Room), #2 Capitol Square, Atlanta, GA; POC – Lisa Myers @ (404) 651-7468 voice, (404) 463-6161 Fax**

WEDNESDAY	0800 - 0815	**Introduction Phase**	Lindsey Gardner, P.E., CVS Team Leader, U.S. Cost, Inc. **(V.E. Team Only)**
		The VETL will review previous events along with activities planned for the week and outline several areas which may be investigated by the V.E. team.	
	0815 - 1000	**Review of Project Plans**	V.E. Team Only
		The team members will review the project plans, cost estimates, available calculations, cost models, and cost bar graphs to gain a working knowledge of the project.	
	1000 - 1200	**Project Design Briefing**	V.E. Team; (A/E), GDOT
		The A/E project design manager will discuss the project requirements and the proposed design solution(s) in some detail. The V.E. team members will ask questions as appropriate to completely understand the GDOT project requirements as established by the user and the proposed design solution (both alternatives considered and those recommended by the design team).	
	1200-1300	Lunch	

WED. (cont.)	1300 - 1700	**Creative Phase**	V.E. Team

The V.E. team will creatively review, (Brainstorm), and tabulate possible design alternatives for the project. While the designer's solution will serve as the "baseline", the team will identify alternatives not in the recommended solution, but deserving of further investigation. Generally, a brainstorming session will produce between 75 and 100 creative design alternatives. Each system will be carefully analyzed with the basic questions in mind:

What is the system/item?
What does it do (what is its basic function)?
What must it do?
What does it cost?
What is the item worth?
What else will do the same, or a better job?
What does that alternative cost?

During the creative phase, the team will not judge the ideas. The essential requirements for the project, however, must always be considered.

THURSDAY	0800 - 1000	**Analysis Phase**	V.E. Team, GDOT Reps

During this phase, all of the ideas or alternatives will be ranked according to their potential for life-cycle (25-year) cost reduction and the potential for acceptance by the user, designers, and other appropriate parties.

	1000 - 1200	**Project Assignments**	VETL

Each team member will be assigned a number of ideas for further development. The ideas will be those with the highest rankings. In general, the ideas will be assigned according to technical discipline; road design, structures, and constructability.

	1200 – 1300	Lunch

THUR. (cont.)	1300 - 1700	**Development Phase**	V.E. Team
		During the development phase, each team member will gather information and prepare written proposals for those ideas assigned to him/her. These may require additional discussions with the A/E, outside contractors and suppliers, and other specialists to fully define the alternative. The team members will prepare sketches, perform calculations and develop other data to support each proposal. In addition, costs will be prepared for each alternative as originally designed, and as proposed by the V.E. team. Life-cycle costs for operation, maintenance and related annual costs will also be considered.	
FRIDAY	0800 - 1200	**Development Phase** (Continued)	
	1200 - 1300	Lunch	
	1300 - 1630	**Development Phase** (Continued)	
	1630 - 1700	**Summary of Results/Workshop Conclusion**	VETL
		The study will be concluded. The final report will be delivered within eight working days of the study's conclusion.	

NOTES: LAPTOP COMPUTERS ARE REQUIRED FOR VE DEVELOPMENT

1. V.E. team members should bring to the workshop any technical and pricing reference manuals which may be used during the study. These may include design handbooks, code documents, estimating price guides, and related documents. Calculators, pencils, sketch paper, scales, and other similar items will also be useful.

2. It is critical that outside telephone calls and other interruptions of the study team members be held to an absolute minimum during the week to allow for efficient, uninterrupted concentration on the Value Engineering Study.

3. Questions concerning the proposed study should be directed to Lindsey Gardner at (757) 496-3055 (e-mail: lgardner@uscost.com) or;

U.S. Cost Incorporated
Mr. Tom Orr, P.E.
1200 Abernathy Road
Atlanta, GA 30328
(770) 481-1600
e-mail: torr@uscost.com

PRELIMINARY COST ESTIMATE

I-20 WIDENING

DATE: 10/14/2004 **PREPARED BY:** Greenhorne & O'Mara, Inc.

PROJECT NO.: NH-IM-20-2(145) **FILE NAME:** const cost estimate.xls

P.I. NO.: 210570

PROJECT DESCRIPTION/CONCEPT: I-20 WIDENING

TRAFFIC: **CURRENT ADT** 57,000 I-20 (2000) **PROJECTED ADT** 98,000 I-20 (2020)

PROJECT COSTS:

A. RIGHT OF WAY (From R/W Office)		lump sum				$0
					SUBTOTAL	**$0**
B. UTILITIES (From District Utilities)		lump sum				
	Power				$0	
	Telephone				$0	
	Water				$0	
	Sewer				$0	
					SUBTOTAL	**$0**
C. CLEARING AND GRUBBING		177	acres	@	$10,500	$1,858,500
					SUBTOTAL	**$1,858,500**
D. EARTHWORK						
	Unclassified Excavation	9600	cu yd	@	$4	$38,400
					SUBTOTAL	**$38,400**
E. BASE AND PAVING						
	Asphalt Paving					
	12.5 mm Superpave	15385	tons	@	$50	$769,253
	19 mm Superpave	37549	tons	@	$45	$1,689,717
	25 mm Superpave	66014	tons	@	$43	$2,838,587
	Bituminous Tack Coat	43616	gallons	@	$1	$43,616
	Leveling	28673	tons	@	$41	$1,175,593
	Aggregate Base					
	Graded Aggregate Base	114890	tons	@	$21	$2,412,690
	Concrete Pavement	132845	sy	@	$39	$5,180,968
					SUBTOTAL	**$14,110,423**

F. DRAINAGE					
Drainage Lump Sum					$700,000
				SUBTOTAL	**$700,000**
G. CONCRETE WORK					
Median Barrier	24800	lin. ft.	@	$85	$2,108,000
				SUBTOTAL	**$2,108,000**
H. TRAFFIC CONTROL		lump sum			$2,300,000
				SUBTOTAL	**$2,300,000**
I. EROSION CONTROL		lump sum			$750,000
				SUBTOTAL	**$750,000**
J. GUARDRAIL					
W-Beam Rail	2060	lin ft	@	$12	$24,720
Type 1 Anchors	11	each	@	$450	$4,950
Type 12 Anchors	4	each	@	$1,500	$6,000
				SUBTOTAL	**$35,670**
K. SIGNS, STRIPING, SIGNALS, LIGHTING					
Striping		lump sum			$80,000
Roadside Signs		lump sum			$150,000
				SUBTOTAL	**$230,000**
L. GRASSING/LANDSCAPING		lump sum			$130,000
				SUBTOTAL	**$130,000**
M. MICELLANEOUS					
Field Engineers Office Tp. 2	1	each	@	$40,000	$40,000
Fencing	7400	lin ft	@	$19	$138,380
				SUBTOTAL	**$178,380**
N. MAJOR STRUCTURES					
I-20 over Washington Road	28140	sf	@	$60	$1,688,400
I-20 over Riverwatch Parkway	28100	sf	@	$150	$4,215,000
Total Bridges					$5,903,400
Sound Barriers	42000	SF	@	$15	$630,000
				SUBTOTAL	**$6,533,400**

ESTIMATE SUMMARY

A. RIGHT OF WAY	$0
B. REIMBURSIBLE UTILITIES	$0

CONSTRUCTION COST SUMMARY

C. Clearing and Grubbing				$1,858,500
D. Earthwork				$38,400
E. Base and Paving				$14,110,423
F. Drainage				$700,000
G. Concrete Work				$2,108,000
H. Traffic Control				$2,300,000
I. Erosion Control				$750,000
J. Guardrail				$35,670
K. Signs, Striping, Signals, Lighting				$230,000
L. Grassing / Landscaping				$130,000
M. Miscellaneous				$178,380
N. Major Structures				$6,533,400
	SUBTOTAL CONSTRUCTION			**$28,972,773**
5	years of inflation at	4	%	$6,277,035.39
		10 %	E & C	$3,524,981
TOTAL CONSTRUCTION ESTIMATE:				**$38,774,789**

TOTAL PROJECT COST ESTIMATE **$38,774,789**

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February 19, 2003

Greenhorne & O'Mara, Inc.
2211 Newmarket Parkway, Suite 104
Marietta, Georgia 30067

Attention: Mr. Robert Miller, P.E.
Vice President

LCCA FOR INTERSTATE I-20
RICHMOND COUNTY, GEORGIA
NH-IM-20-2(145)

Professional Service Industries, Inc. (PSI) is pleased to be providing geotechnical services for the Davis Road, I-520 Interchange, and I-20 Widening and Reconstruction projects located in Richmond County, Georgia. Per the request of J.T. Rabun with Georgia Department of Transportation Office of Materials and Research, we have performed a Life Cycle Cost Analysis (LCCA) for the I-20 widening from stations ST 188+45 to ST 322+10. The outside shoulder and one outside lane will be replaced during the I-20 rehabilitation, which is currently underway. The subsequent widening of I-20 will include the addition of 1½ lane along the inside shoulder. This will allow for a ½ lane shift to the inside of I-20. Attached please find the LCCA.

The existing pavement section consists of 9-inches of concrete and 3-inches of stabilized granular base. The alternatives considered for this LCCA are as follows:

1. Full depth reconstruction of rigid pavement with 12-inches of Plain Portland Cement Concrete (PCC), 5-inches of 25 mm Asphalt Concrete (AC) Base, and 12-inches of Graded Aggregate Base (GAB) with full depth asphalt shoulders.
2. Full depth reconstruction of flexible pavement with 1.25-inches of PEM, 1.5-inches of 12.5 mm AC, 2-inches of 19 mm AC, 8-inches of 25 mm AC Base, and 12-inches of GAB with full depth asphalt shoulders.

It should be noted that the pavement thickness used for this study are based on the typical sections we have been provided, as well as our understanding of the proposed pavement thickness for other portions of I-20 in this general area. Once our field and laboratory tests have been completed, a pavement design for the flexible pavement section will be performed to provide specific pavement thickness for this portion of I-20.

The annualized costs over a 40-year life span and total Net Present Value (NPV) for both alternatives are as follows:

Alternate	40-Year Annualized Cost	Net Present Value (NPV)
Full Depth Asphalt with Asphalt Shoulders	$ 188,853	$ 4,365,290
Full Depth Concrete with Asphalt Shoulders	$ 160,504	$ 3,710,004

This analysis was based on the following assumptions and criteria:

- A 40-year analysis period was requested.
- Rigid Pavement rehabilitation consisting of diamond grinding and joint sealing will be performed every 20 years.
- Flexible pavement rehabilitation consisting of milling 4-inches and inlaying with 1.25-inches PEM, 1.5-inches of 12.5 mm AC, and 2-inches 19 mm AC at 10-year intervals.
- A discount rate (interest rate minus inflation) of 3%.
- Georgia Department of Transportation Mean Item Summary was used for the unit prices.
- The salvage value of the rigid and flexible pavements was zero.
- No user costs were considered.
- This analysis only considered pavement costs. Other items such as staging, traffic control, bridge clearances, and subgrade work, such as additional grading, were not considered.

If you have any questions, or if we may be further service, please do not hesitate to call. We look forward to working with you further on these projects.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

Brian K. Ingram, P.E.
Department Manager

Thomas G. Santee, P.E.
Senior Engineer

CC: J.T. Rabun – Georgia Department of Transportation
Tom Hodges – Georgia Department of Transportation

GENERAL NOTES:

Rigid Pavements		
PCC	12	inches
25 mm Superpave	5	inches
GAB	12	inches

Flexible Pavements		
PEM	1.25	inches
12.5 mm Superpave	1.5	inches
19 mm Superpave	2	inches
25 mm Superpave	8	inches
GAB	12	inches

Units		
AC Wt	110	lbs/yd^2/in
GAB Wt	150	lbs/cuft
Tackcoat	0.007	gal/sqyd

Stations	188+45 to 322+10	
Length	2.53	miles
Number Lanes	2.5	
Lane Width	12	ft
Inside Shoulder	14	ft
Outside Shoulder	16	ft

Joints	264	per mile
Length per joint	52	ft

OPTION 1: Full Depth Concrete

	Quantity/mile	Units	Unit Cost	Cost/mile		
Slab Removal						
	7040	sqyd	$25.00	$176,000.00		
				Total cost:	**$176,000.00**	**Per mile one way**
Full Depth Concrete						
PCC	17600	sqyd	$50.15	$882,640.00		
25 mm Superpave	4840	tn	$37.50	$181,500.00		
GAB	17600	sqyd	$12.41	$218,416.00		
				Total cost:	**$1,282,556.00**	**Per mile one way**
Inside Shoulder						
12.5 mm PEM	565	tn	$57.90	$32,694.20		
12.5 mm SMA	678	tn	$60.56	$41,035.46		
19 mm Superpave	1807	tn	$42.19	$76,234.52		
25 mm Superpave	2710	tn	$37.50	$101,640.00		
GAB	8213	sqyd	$12.41	$101,927.47		
Tack	230	gl	$0.91	$209.28		
				Total cost:	**$353,740.92**	**Per mile one way**
			Total Construction Cost:		**$1,812,296.92**	**Per mile one way**
					$3,624,593.83	**Per mile**
Future Rehab (Every 20 years)						
Diamond Grinding	21120	sqyd	$2.69	$56,812.80		
Resealing Joints	13728	lf	$1.48	$20,317.44		
				Total cost:	**$77,130.24**	**Per mile one way**
			Total Rehab cost:		**$77,130.24**	**Per mile one way**
					$154,260.48	**Per mile**

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OPTION 1: Full Depth Asphalt

	Quantity/mile	Units	Unit Cost	Cost/mile		
Slab Removal						
	7040	sqyd	$25.00	$176,000.00		
				Total cost:	**$176,000.00**	**Per mile one way**
Full Depth Asphalt						
PEM	1210	tn	$57.90	$70,059.00		
12.5 mm Superpave	1452	tn	$60.56	$87,933.12		
19 mm Superpave	1936	tn	$42.19	$81,679.84		
25 mm Superpave	7744	tn	$37.48	$290,322.56		
GAB	17600	sqyd	$12.41	$218,416.00		
Tack	493	gl	$0.91	$448.45		
				Total cost:	**$748,858.97**	**Per mile one way**
Inside Shoulder						
12.5 mm PEM	565	tn	$57.90	$32,694.20		
12.5 mm SMA	678	tn	$60.56	$41,035.46		
19 mm Superpave	1807	tn	$42.19	$76,234.52		
25 mm Superpave	2710	tn	$37.50	$101,640.00		
GAB	6213	sqyd	$12.41	$101,927.47		
Tack	230	gl	$0.91	$209.28		
				Total cost:	**$353,740.92**	**Per mile one way**
Ashalt Overlay						
Diamond Grinding	7040	sqyd	$2.69	$18,937.60		
PEM	484	tn	$57.90	$28,023.60		
12.5 mm Superpave	581	tn	$60.56	$35,173.25		
19 mm Superpave	774	tn	$42.19	$32,671.94		
Leveling	774	tn	$35.22	$27,274.37		
Tack	197	gl	$0.91	$179.38		
				Total cost:	**$142,260.13**	**Per mile one way**
Outside Shoulder Overlay						
Diamond Grinding	9387	sqyd	$2.69	$25,250.13		
12.5 mm SMA	766	tn	$60.56	$46,409.15		
19 mm Superpave	2108	tn	$42.19	$88,922.12		
Leveling	1033	tn	$35.22	$36,365.82		
Tack	209	gl	$0.91	$190.55		
				Total cost:	**$197,137.78**	**Per mile one way**
				Total Construction Cost:	**$1,617,997.79**	**Per mile one way**
					$3,235,995.58	**Per mile**
Future Rehab (Every 10 years)						
Milling	21120	sqyd	$2.00	$42,240.00		
PEM	1452	tn	$57.90	$84,070.80		
12.5 mm Superpave	1742	tn	$60.56	$105,519.74		
19 mm Superpave	2323	tn	$42.19	$98,015.81		
Tack	444	gl	$0.91	$403.60		
				Total cost:	**$330,249.96**	**Per mile one way**
				Total Rehab cost:	**$330,249.96**	**Per mile one way**
					$660,499.91	**Per mile**

I-20 In Richmond County
40 Year Life Cycle Cost Analysis
Costs Per Mile

Full Depth Asphalt Reconstruction

Years	0	10	20	30	40
Agency Cost (Constant $)	$3,235,996	$660,500	$660,500	$660,500	
Present Worth Factor	1.0000	0.7441	0.5537	0.4120	0.3066
Agency Cost (Present Worth)	$3,235,996	$491,474	$365,703	$272,117	
Total NPV (Agency Cost)	$4,365,290				
Annualized Cost	$188,853				

Full Depth PCC Reconstruction

Years	0	20	40
Agency Cost (Constant $)	$3,624,594	$154,260	
Present Worth Factor	1.0000	0.5537	0.3066
Agency Cost (Present Worth)	$3,624,594	$85,410	$0
Total NPV (Agency Cost)	$3,710,004		
Annualized Cost	$160,504